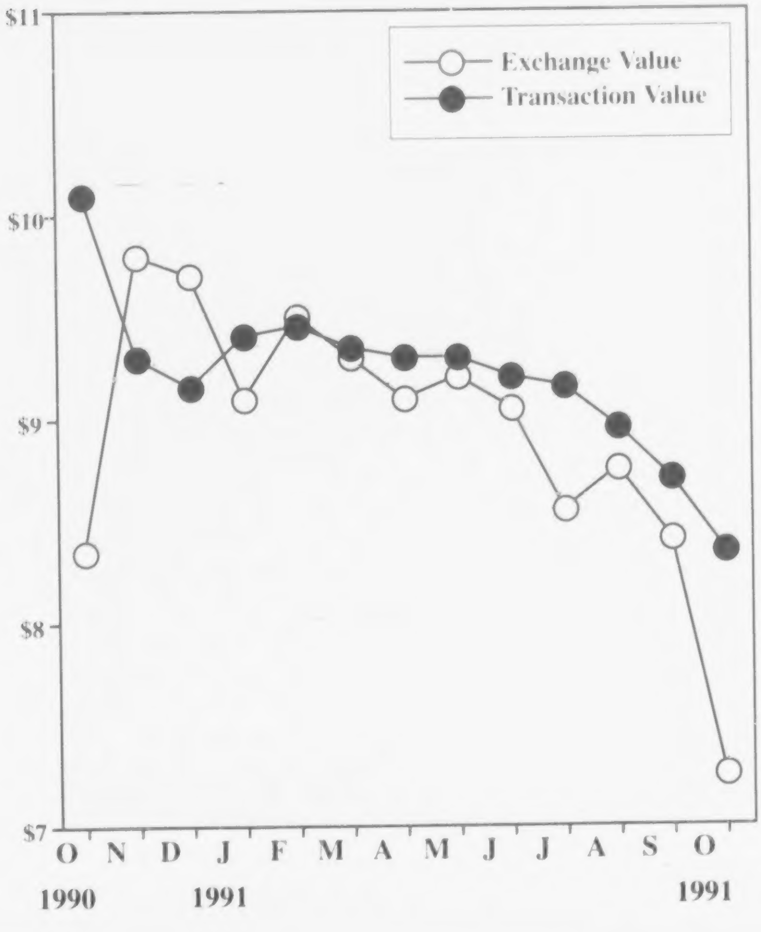
NUEXCO

Monthly Report

November 1991 Number 279

World Nuclear Generating Capacity and Uranium Requirements to 2005 18

Hungary: Meeting Electricity Needs With Nuclear Power 26



NUEXCO

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- **World Nuclear Generating Capacity and Uranium Requirements to 2005**

NUEXCO forecasts installed nuclear electric generating capacity to grow at an average rate of 2.4 percent per year and to reach 448GWh by 2005. This capacity growth will cause world uranium requirements to grow, exceeding 200 million pounds equivalent U_3O_8 by 2005.

Focus 26
- **Hungary: Meeting Electricity Needs With Nuclear Power**

Hungary relies on imports for almost one-third of its electricity supply. While the Paks nuclear station already provides over 50 percent of the country's domestically generated electricity, the government has recognized that its dependence on energy imports make nuclear power even more important and it is examining nuclear as a source for additional generating capacity.

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To Our Readers

Coalition Files Anti-Dumping Petition

On November 8, 1991, certain uranium producers with US production, and the Oil, Chemical, and Atomic Workers Union, filed a petition with the US Department of Commerce and the US International Trade Commission charging that uranium is being dumped in the United States by the Soviet Union and the individual Republics that are part of the U.S.S.R. The petition claims that Soviet trade practices are causing injury and threatening further injury to the US uranium industry. The case applies to all natural and enriched uranium from the Soviet Union and seeks anti-dumping duties on all such imports.

The antidumping petition will be determined by two US government agencies, the Department of Commerce and the International Trade Commission. If the Department of Commerce finds that "dumping" (sales in the USA at less than fair value) of Soviet natural or enriched uranium have taken place, and the International Trade Commission finds that these imports have caused or threatened material injury, then future uranium imports from the Soviet Union of Soviet-produced uranium will be subject to additional duties. In such case, antidumping duties would go into effect in the spring of 1992. NUEXCO has always favored open trade without government intervention. NUEXCO believes this petition is unfounded, and, therefore, opposes it.

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November 1991
No. 279

MARKET REVIEW

Market Values Summary

NUEXCO Market Values	This Report October 31, 1991	Last Report September 30, 1991	12 Months Ago October 31, 1990
EXCHANGE VALUE[1]	**\$7.25** / lb equivalent U_3O_8	\$8.40	\$8.35
UF_6 VALUE[2]	**\$22.75** / kg U as UF_6	\$25.50	\$24.75
LOAN RATE[3]	**3.5%** / annum	3.5%	3.5%
CONVERSION VALUE[4]	**\$1.55** / lb U as UF_6	\$1.55	\$1.45
SWU VALUE[5] **(0.3 w/o tails assay)**	**\$68** / SWU	\$67	\$51
TRANSACTION VALUE[6]	**\$8.35** / lb equivalent U_3O_8	\$8.70	\$10.10
Transactions	**22**	20	12
Months	**3**	3	3
Millions of Pounds	**4.6**	4.4	2.3

DEFINITIONS

[1] The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

[2] The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

[3] The **Loan Rate** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

[4] The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

[5] The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

[6] The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

a) Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;
b) At least ten transactions;
c) Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US\$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.
- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.
- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight-percent U^{235} and a product assay of 3.0 weight-percent U^{235}, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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OCTOBER MARKET REVIEW

(as of October 31, 1991)

OVERVIEW

Uranium market prices continued their tumble during October, and the Exchange Value fell to a record low of $7.25 per pound U_3O_8. Limited demand and an abundance of supply offered by multiple suppliers drove the decrease. UF_6 prices also fell as a result of virtually no demand; NUEXCO's UF_6 Value dropped $2.75, to $22.75 per kgU as UF_6.

Six near-term uranium transactions were reported, four involving concentrates, and two involving natural UF_6. These six sales totalled almost 1.1 million pounds equivalent U_3O_8 and raised the 1991 year-to-date market volume to 20.4 million pounds (**Table 1**).

The Conversion Value remained at $1.55 per pound U as UF_6. Two conversion sales totalling over 250 thousand pounds U were reported. The Loan Rate withstood some downward market pressure, and remained at 3.5 percent per annum. Only one loan for a moderate quantity of concentrates was reported.

The SWU Value climbed one dollar, to $68 per SWU, as near-term supplies tightened. Two SWU transactions, both for small quantities, were reported in October.

NATURAL URANIUM AND CONVERSION

Last year's October 31 Exchange Value set a new record low in constant dollar terms, falling to $8.35 per pound U_3O_8. Now, one year later, sellers wish prices would recover to that level; the October 31, 1991 **Exchange Value** dropped to **$7.25** per pound U_3O_8, down $1.15. When adjusted for inflation, this is the all-time record low Exchange Value (**Figure 1**). Low levels of demand throughout the month, combined with aggressive selling by several suppliers, progressively forced the market down to this new low. An additional influence was the expectation of another government-controlled stockpile entering the market. This speculation created an environment in which discretionary buyers were hesitant to conclude deals, in anticipation of further price declines. Although the immediate availability of this stockpile was questionable, during October its impending sale was an important factor.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	October 1991		Year-to-Date	
	No. of Sales	Volume[1]	No. of Sales	Volume[1]
Concentrates	4	0.7	59	12.5
Natural UF_6	2	0.4	20	5.7
EUP	0	0.0	9	2.2
Total[2]	**6**	**1.1**	**88**	**20.4**

[1] Million pounds equivalent U_3O_8

[2] Due to independent rounding, columns may not equal total.

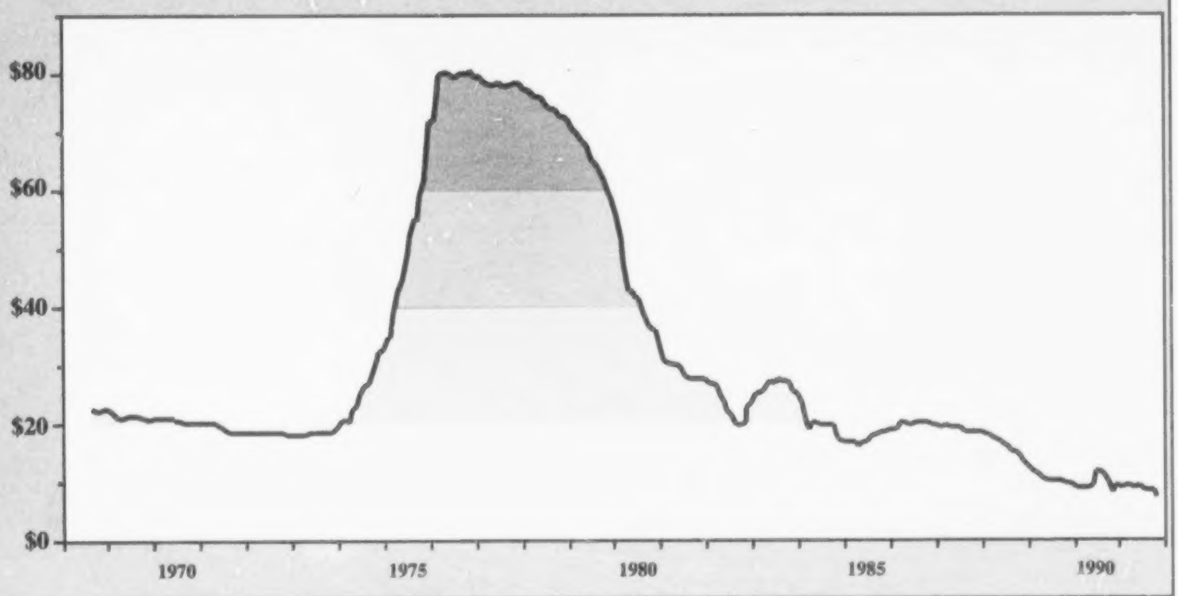
Overall, however, lack of demand was the crucial factor influencing the market. This demand situation was compounded by several suppliers' eagerness to sell, resulting in record-low prices. But even at these levels, discretionary buyers have been slow to enter the market. Over the past few years, discretionary buyers have made purchases at perceived market bottoms, only to watch prices continue to fall, and as a result, they are now justifiably cautious.

Only four concentrates transactions were reported in October, totalling less than 700 thousand pounds equivalent U_3O_8. Two utilities and two producers purchased material from US sellers. The purchases made earlier in the month occurred at levels slightly above the October 31 Exchange Value. No long-term uranium transactions were reported.

* * *

The **UF_6 Value** also dropped significantly, falling $2.75, to **$22.75** per kgU as UF_6. This 10.8% decline also brings the UF_6 Value to a new all-time low, both in constant dollar and absolute terms, although the UF_6 Value has been published only since April 30, 1985. While supply of UF_6 is somewhat lower compared to the abundance of concentrates, virtually no demand exists for UF_6.

Figure 1
HISTORICAL NUEXCO EXCHANGE VALUE IN CONSTANT 1990 US DOLLARS



Consequently, the UF6 market is greatly influenced by the concentrates market. Only two natural UF6 transactions were reported, in which US utilities purchased over 400 thousand pounds equivalent U_3O_8 from intermediaries for delivery before year end. No enriched uranium product sales were reported.

* * *

Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply[1]	Active Demand[1]
• Uranium (thousand lbs equivalent U_3O_8)	7,315	1,610
• Supply/Demand Ratio:	4.5	
• Loan (thousand lbs equivalent U_3O_8)	5,485	0
• Conversion (thousand lbs U as UF6)	880	0
• SWU (thousand SWUs)	400	100

[1] Supply and Demand tables in the Market Review section of this Report provide details for each category.

The **Transaction Value** continued its steady decline, falling $0.35, to **$8.35** per pound U_3O_8 based on 22 transactions over three months involving 4.6 million pounds equivalent U_3O_8. The higher prices and higher volume associated with August's sales continue to buoy the Transaction Value in this declining market.

* * *

Contrary to what might be expected in a falling market, **active uranium supply** increased to **7.3** million pounds equivalent U_3O_8, demonstrating the abundance of supply and the willingness of sellers to provide material, even at these low prices. The low prices have drawn some buyers into the market and **active uranium demand** has begun to increase, rising to **1.6** million pounds equivalent U_3O_8, from last month's level of only 450 thousand pounds. The **supply/demand ratio** declined to **4.5**.

* * *

The **Loan Rate** remained unchanged at **3.5** percent per annum, thus marking four years at the same level. However, several key factors are exerting strong downward pressure on the Loan Rate: very low demand from borrowers, a willingness by several suppliers to lend material, and significantly lower interest rates in the USA.

Only one loan was reported, in which a producer borrowed a moderate quantity of concentrates.

* * *

The **Conversion Value** remained at **$1.55** per pound U as UF_6, as ample supply met any emerging demand at current market levels during October. Two near-term conversion transactions were reported in which European and US utilities purchased moderate quantities of conversion services at prices near the October 31 Conversion Value. In addition, one long-term conversion sale was reported; a utility agreed to purchase a portion of its requirements for 1992 through 1997 from a primary converter.

ENRICHMENT SERVICES

The **SWU Value** climbed one dollar, to **$68** per SWU, as near-term supplies tightened, creating upward pressure on the market. Two enrichment transactions were reported, in which European and US utilities purchased small quantities of SWU from intermediaries. No long-term enrichment sales were reported, although at month end, six buyers continued to evaluate long-term offers for up to 4.8 million SWU for delivery through 2001.

Table 3
ENRICHMENT PRICES
(October 31, 1991)

Prices	This Month Report 279	Last Month Report 278	12 Months Ago Report 267
NUEXCO SWU Value ($US per SWU)	68	67	51
US DOE SWU prices: ($US per SWU)			
USEC	121.50[1]	121.50[1]	117.85[2]
AFC	153.00[3]	153.00[3]	153.00[3]
Requirements	157.00[3]	157.00[3]	157.00[3]
Incentive Price (IP2)	104.67[4]	104.67[4]	100.68[5]
Calculated worth of enriched UF_6[6]: ($US per KgU as UF_6)			
2.0 w/o U^{235}	208	219	190
2.5 w/o U^{235}	292	306	263
3.0 w/o U^{235}	380	396	339
3.5 w/o U^{235}	469	488	416
4.0 w/o U^{235}	560	582	494
4.5 w/o U^{235}	652	677	573

[1] Effective 10/1/91.
[2] Effective 10/1/89 to 9/30/91.
[3] Effective since 10/1/84.
[4] Provisional IP2 for FY92: Effective 10/1/91 to 9/30/92, for up to 30% of annual requirements.
[5] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.
[6] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 w/o U^{235} tails assay.

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RECENT TRANSACTIONS

Uranium Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5261	1991	101-300	90-97	Producer	Producer	
5267	1991	101-300	103-110	Utility	Intermediary	
5268	1991	101-300	103-110	Utility	Intermediary	UF_6
5272	1992	50-100	103-110	Producer	Intermediary	
5274	1991	101-300	98-102	Utility	Intermediary	UF_6
5275	1992	101-300	103-110	Utility	Intermediary	

Natural Uranium Loans[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Loan Rate	Borrower	Lender	Remarks
5266	1991	101-300	R	Producer	R	

Conversion Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range[2] of Current Conversion Value	Buyer	Seller	Remarks
5270	1992-1997	3,001-5,000	See Remarks	Utility	Convertor	Base Escalated
5276	1991	101-300	98-102	Utility	Convertor	
5279	1992	50-100	90-97	Utility	R	

Enrichment Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity[3] (thousand SWU)	Price Within Percentage Range[2] of Current SWU Value[4]	Buyer	Seller	Remarks
5271	1992	Less than 50	98-102	Utility	Intermediary	
5273	1992	Less than 50	98-102	Utility	Intermediary	

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110,* represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., X dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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MARKET REVIEW

SUPPLY AND DEMAND

Uranium Supply

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE TO PURCHASE:				
ACTIVE				
90-1227	500	—	1991	
90-1307	330	—	1991	
91-1215	785	—	1992	
91-1502	500	—	1991	
91-1505*	1,000	—	1991	
91-1506	500	—	1991	
91-1507	500	—	1991	
91-1511*	260	—	1991	UF_6
91-1512*	785	—	1991	UF_6
91-1513*	1,000	—	1991	
91-1241*	655	650 per year	1992-1996	
91-1503A	500	3,500	1991-1993	UF_6e
TOTAL	**7,315**			
INACTIVE	**3,930**			
AVAILABLE TO LOAN:				
ACTIVE				
91-1084	3,900	—	—	U_3O_8
91-1219	260	—	—	U_3O_8
91-1220	325	—	—	UF_6
91-1174*	1,000	—	—	U_3O_8
TOTAL	**5,485**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: *none*

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SUPPLY AND DEMAND

Uranium Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
INQUIRIES TO PURCHASE:				
ACTIVE				
90-1304*	175	—	1992	
91-1234*	25	—	1992	U_3O_8/UF_6
91-1235*	400	—	1991-1992	U_3O_8/UF_6
91-1246*	100	—	1991	
91-1249*	50	—	1991-1992	
91-1256*	120	—	1991-1992	
91-1257*	100	—	1992	
91-1258*	240	—	1992	
91-1259*	400	—	1992	
91-1118	—	300 per year	1993-1998	U_3O_8/UF_6
91-1184	—	350 per year	1993-1997	
91-1197	—	2,210	1992-1997	U_3O_8/UF_6
91-1227A	—	60	1992-1994	UF_6e
91-1245*	—	1,000	1993-1997	
91-1255*	—	2,250	1993-1996	
TOTAL	**1,610**			
INACTIVE	**1,595**			

INQUIRIES TO BORROW: *No inquiries to borrow are reported*

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 91-1209, 91-1214, 91-1223, 91-1229

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SUPPLY AND DEMAND

Conversion Supply and Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF$_6$) Within 3 Years[1]	Beyond 3 Years[1]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1500*	440	—	1991	
91-1501*	440	—	1991	
TOTAL	880			
INACTIVE	*None reported*			

INQUIRIES TO PURCHASE: *No inquiries to purchase are reported*

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 91-1170, 91-1202, 91-1221

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SUPPLY AND DEMAND

SWU Supply And Demand

NUEXCO Project Number	Quantity (Thousand SWUs) Spot or Near-term[1]	Quantity (Thousand SWUs) Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
90-1078D*	200	—	1991	UF6e
91-1509	200	—	1992	
TOTAL	**400**			
INACTIVE	**935**			
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1187*	100	—	1992	
90-1196	—	60 per year	1995 on	
91-1027	—	55 per year	1996-2000	
91-1094B	—	385 per year	1994-1995	UF6e
91-1142	—	75 per year	1995-2000	
91-1199	—	385 per year	1996-2000	
91-1232*	—	400	1993-1994	
91-1250*	—	45	1993	UF6e
91-1066	—	320	1995-2000	
91-1152	—	2,700	1995-2001	
91-1171	—	560	1995-1998	
91-1227B	—	35	1992-1994	UF6e
TOTAL	**100**			
INACTIVE	**265**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 91-1206, 91-1210, 91-1211, 91-1218, 91-1224, 91-1500

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MARKET REVIEW

MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Exchange Value[1]

	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
Country (currency)	**This Month (Oct 31, 1991)**	**Last Month (Sept 30, 1991)**	**12 Months Ago (Oct 31, 1990)**	**This Month (Oct 31, 1991)**	**Last Month (Sept 30, 1991)**	**12 Months Ago (Oct 31, 1990)**
Australia (dollar)	9.21	10.51	10.65	23.93	27.33	27.69
Belgium (franc)	249.40	287.97	260.12	648.38	748.65	676.27
Canada (dollar)	8.15	9.50	9.74	21.18	24.71	25.33
EC (ecu)	5.94	6.82	6.16	15.43	17.73	16.02
Finland (markka)	29.58	34.06	30.06	76.90	88.55	78.15
France (franc)	41.43	47.63	42.29	107.72	123.82	109.95
Germany (mark)	12.13	13.97	12.63	31.52	36.32	32.85
Italy (lira)	9,084	10,456	9,465	23,617	27,182	24,607
Japan (yen)	948.33	1,116	1,075	2,465	2,901	2,794
Netherlands (guilder)	13.66	15.75	14.24	35.50	40.95	37.03
So. Africa (comm. rand)	20.54	23.56	21.26	53.39	61.26	55.28
So. Korea (won)	5,438	6,111	5,971	14,137	15,888	15,522
Spain (peseta)	762.68	885.80	791.54	1,983	2,303	2,058
Sweden (krona)	44.51	51.00	46.91	115.71	132.59	121.96
Switzerland (franc)	10.65	12.18	10.70	27.68	31.66	27.81
Taiwan (dollar)	188.50	220.08	223.61	490.05	572.16	581.35
UK (pound)	4.17	4.80	4.27	10.84	12.47	11.11
US (dollar)	7.25	8.40	8.35	18.85	21.84	21.71

Transaction Value[1]

	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
Country (currency)	**This Month (Oct 31, 1991)**	**Last Month (Sept 30, 1991)**	**12 Months Ago (Oct 31, 1990)**	**This Month (Oct 31, 1991)**	**Last Month (Sept 30, 1991)**	**12 Months Ago (Oct 31, 1990)**
Australia (dollar)	10.60	10.89	12.88	27.57	28.31	33.49
Belgium (franc)	287.24	298.25	314.64	746.75	775.39	818.00
Canada (dollar)	9.38	9.84	11.79	24.39	25.59	30.64
EC (ecu)	6.84	7.06	7.45	17.78	18.37	19.38
Finland (markka)	34.07	35.28	36.36	88.57	91.72	94.53
France (franc)	47.72	49.33	51.16	124.06	128.24	133.00
Germany (mark)	13.97	14.47	15.28	36.31	37.62	39.73
Italy (lira)	10,462	10,829	11,449	27,200	28,153	29,764
Japan (yen)	1,092	1,156	1,300	2,840	3,005	3,379
Netherlands (guilder)	15.73	16.31	17.23	40.89	42.41	44.79
So. Africa (comm. rand)	23.65	24.40	25.72	61.50	63.44	66.86
So. Korea (won)	6,263	6,330	7,222	16,282	16,455	18,776
Spain (peseta)	878.39	917.43	957.44	2,284	2,385	2,489
Sweden (krona)	51.26	52.82	56.74	133.26	137.33	147.52
Switzerland (franc)	12.26	12.61	12.94	31.88	32.79	33.64
Taiwan (dollar)	217.10	227.94	270.48	564.41	592.59	703.19
UK (pound)	4.80	4.97	5.17	12.48	12.92	13.43
US (dollar)	8.35	8.70	10.10	21.71	22.62	26.26

[1] As of May 1991 Report #273; calculated using currency exchange rates **for** the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273; calculated using currency exchange rates published in *The Wall Street Journal* **on** the last business day of the month.

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Conversion Value[1]

	per lb U as UF_6			per kg U as UF_6		
Country (currency)	**This Month (Oct 31, 1991)**	**Last Month (Sept 30, 1991)**	**12 Months Ago (Oct 31, 1990)**	**This Month (Oct 31, 1991)**	**Last Month (Sept 30, 1991)**	**12 Months Ago (Oct 31, 1990)**
Australia (dollar)	1.97	1.94	1.85	4.34	4.28	4.08
Belgium (franc)	53.32	53.14	45.17	117.55	117.15	99.59
Canada (dollar)	1.74	1.75	1.69	3.84	3.87	3.73
EC (ecu)	1.27	1.26	1.07	2.80	2.77	2.36
Finland (markka)	6.32	6.29	5.22	13.94	13.86	11.51
France (franc)	8.86	8.79	7.34	19.53	19.37	16.19
Germany (mark)	2.59	2.58	2.19	5.72	5.68	4.84
Italy (lira)	1,942	1,929	1,646	4,282	4,253	3,624
Japan (yen)	202.75	205.93	186.62	446.98	453.99	411.42
Netherlands (guilder)	2.92	2.91	2.47	6.44	6.41	5.45
So. Africa (comm. rand)	4.39	4.35	3.69	9.68	9.59	8.14
So. Korea (won)	1,163	1,128	1,037	2.563	2,486	2,286
Spain (peseta)	163.05	163.45	137.45	359.47	360.35	303.03
Sweden (krona)	9.52	9.41	8.15	20.98	20.75	17.96
Switzerland (franc)	2.28	2.25	1.86	5.02	4.95	4.10
Taiwan (dollar)	40.30	40.61	38.83	88.85	89.53	85.61
UK (pound)	0.89	0.89	0.74	1.97	1.95	1.64
US (dollar)	1.55	1.55	1.45	3.42	3.42	3.20

SWU Value And UF_6 Value[1]

	SWU Value at 0.30 w/o Tails Assay			UF_6 Value per kg U as UF_6		
Country (currency)	**This Month (Oct 31, 1991)**	**Last Month (Sept 30, 1991)**	**12 Months Ago (Oct 31, 1990)**	**This Month (Oct 31, 1991)**	**Last Month (Sept 30, 1991)**	**12 Months Ago (Oct 31, 1990)**
Australia (dollar)	86.35	83.85	65.05	28.89	31.91	31.57
Belgium (franc)	2,339	2,297	1,589	782.59	874.19	771.03
Canada (dollar)	76.40	75.81	59.52	25.56	28.85	28.88
EC (ecu)	55.68	54.40	37.64	18.63	20.71	18.27
Finland (markka)	277.44	271.68	183.60	92.82	103.40	89.10
France (franc)	388.62	379.88	258.32	130.01	144.58	125.36
Germany (mark)	113.73	111.43	77.17	38.05	42.41	37.45
Italy (lira)	85,202	83,396	57,810	28,505	31,740	28,055
Japan (yen)	8,895	8,901	6,564	2,976	3,388	3,185
Netherlands (guilder)	128.08	125.63	87.00	42.85	47.82	42.22
So. Africa (comm. rand)	192.63	187.94	129.87	64.45	71.53	63.03
So. Korea (won)	51,001	48,745	36,468	17,063	18,552	17,698
Spain (peseta)	7,153	7,065	4,835	2,393	2,689	2,346
Sweden (krona)	417.43	406.80	286.52	139.66	154.83	139.04
Switzerland (franc)	99.85	97.14	65.33	33.41	36.97	31.71
Taiwan (dollar)	1,768	1,755	1,366	591.49	668.10	662.81
UK (pound)	39.10	38.26	26.09	13.08	14.56	12.66
US (dollar)	68.00	67.00	51.00	22.75	25.50	24.75

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[1] As of May 1991 Report #273; calculated using currency exchange rates **for** the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273; calculated using currency exchange rates published in *The Wall Street Journal* **on** the last business day of the month.

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RECENT DEVELOPMENTS

WASHINGTON FOCUS

by Linda L. Gunter

The House of Representatives was active this month in considering uranium enrichment restructuring legislation: the House Energy & Power Subcommittee marked up Rep. Philip Sharp's (D-IN) proposal to restructure DOE's enrichment program and the Interior Committee's Energy & Environment Subcommittee held a hearing on this same issue October 29. The House also voted October 30 to reauthorize the Export Administration Act. At the end of the month, the National Academy of Science report on alternative uses for AVLIS technology became public. The Senate attempted consideration of the National Energy Strategy bill (S 1220) sponsored by Sen. J. Bennett Johnston (D-LA) and Sen. Malcolm Wallop (R-WY). However, when the bill reached the Senate floor on November 1, filibuster threats from Senators opposed to opening the Arctic National Wildlife Refuge to oil drilling were successful in preventing the Senate from debating the issue and voting on the bill as a package.

House Energy Subcommittee Markup of Enrichment Restructuring Bill

On October 17, the House Energy & Power Subcommittee marked up Rep. Sharp's uranium enrichment restructuring bill. This bill would create a government corporation that would retain DOE's current contracts and their revenue, could purchase SWU or enriched uranium product, and could lease the Gaseous Diffusion Plants (GDP) to produce SWU. A working capital fund of $364 million would be provided by the government and be returned with interest to the Treasury over a 20-year period.

The bill would not allow the Corporation to issue bonds to fund construction of any enrichment facilities, and although predeployment demonstration activities for AVLIS could continue, no commercial scale facility could be built until the Corporation was privatized. Presumably this requirement is to prevent the Corporation from remaining a government entity while it deploys AVLIS, thus placing all the financial risk with the private sector.

The controversial creation of a fund for decommissioning and decontamination (D&D) of the gas diffusion plants was left to the full Energy & Commerce Committee to resolve. Rep. Sharp's proposal creates a fund sufficient to cover the current estimate of D&D cost—$20 billion for the three plants. This figure is reportedly DOE's estimate of total D&D, although the D&D report Ebasco Corporation has prepared under contract to DOE has not been made public. In order to raise the money, Rep. Sharp has calculated the Corporation must contribute $500 million per year (indexed to inflation) to a D&D fund. The $500 million would be raised by a combination of leasing payments on the GDPs, royalty payments for AVLIS, annual payment on the $364 million Treasury loan, and if not enough money is accumulated from those sources, a millage fee assessed on nuclear power plants. At the markup, Rep. Carlos Moorhead (R-CA) offered a counter-proposal which was accepted, and provided a means of deferring debate on the issue until full committee consideration. The Moorhead amendment retains all of the provisions except the millage fee. In its place would be a retroactive fee on DOE's enrichment customers, "subject to a DOE rulemaking". No mention is made of a military share, although the bill does allow the Corporation to collect for D&D in its SWU prices to the military. Rumors persist of a new DOE bill to reflect D&D numbers greater than the $3 billion historically projected, and a mechanism for its collection, but the difficulty of collecting money for a fund of $20 billion or more may make the Corporation's SWU prices so uncompetitive that DOE may not want to release the bill.

Rep. Sharp's uranium enrichment restructuring bill was voted out of committee, 21 to 1, with only Rep. Mike Synar (D-OK) opposing it. Rep. Sharp has incorporated

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this proposal in his larger energy policy bill (HR 776), so the proposal has not been introduced as separate legislation and thus does not have a number of its own. The Subcommittee has completed its work on the entire energy package, but the full committee will not begin consideration of the bill until next year.

Interior Subcommittee Hearing on Enrichment Restructuring

The House Energy & Environment Subcommittee, chaired by Rep. Peter H. Kostmayer (D-PA), held a hearing October 29 on various bills to restructure DOE's uranium enrichment program into a government corporation. Rep. Kostmayer plans to introduce his own enrichment bill within the next two weeks. The first witnesses were congressmen with GDPs in their districts: Rep. Carroll Hubbard (D-KY) and Rep. Bob McEwen (R-OH). They have introduced legislation for the Bush Administration (HR 145) creating a government corporation. Both witnesses stressed DOE's lack of competitiveness in the world market, and the need to have a domestic industry to help the US trade balance, ensure energy independence, and preserve US national security.

The next witness was DOE Assistant Secretary for Nuclear Energy, William Young, who was questioned about DOE's estimate of the cost of D&D of the GDPs. The Subcommittee had obtained several versions of a study for DOE conducted by Ebasco Corporation on these costs, and the different versions contained cost estimates varying from $20 billion to $45 billion. Rep. Kostmayer wanted a clarification of which estimate DOE plans to use, but Mr. Young was unable to respond adequately to the Committee because the administration is still struggling to establish its policy on D&D. Part of the problem is that the Ebasco report considers D&D, environmental cleanup, and tailings cleanup costs, whereas the figures DOE has publicly referred to apply only to the cost of D&D. The initial estimate for D&D costs may have been calculated in current (1992) dollars, but the actual cost of cleanup could be well beyond whatever number DOE projects this year. Mr. Young promised that the final study and DOE's new legislation will be made public in "several weeks".

In later statements, representatives of GAO clarified some of the confusion about the various D&D estimates. GAO characterized the high numbers included in the first draft of the Ebasco report as a "worst case scenario". DOE was able to have Ebasco reduce the estimate of D&D costs by making some policy decisions altering some of the basic assumptions underlying the analysis, such as removing the necessity to restore the GDP sites to their original condition (greenfielding). GAO testified that the latest version of the Ebasco report has $16.1 billion for D&D, $4.5 billion for remedial action, and $1.5 billion for tailings cleanup, which totals $22.1 billion. GAO believes these lower numbers were developed as DOE's review of the contractor report progressed and other assumptions, such as the need to build D&D facilities at all three sites, were eliminated. A concept called "prompt dismantlement" replaced greenfielding, further reducing the cost estimates. GAO testified it expects the final cost to be higher, based on past experience with government estimates. GAO is working on its own D&D analysis and plans to publish a report early next year.

On another topic, Chairman Kostmayer questioned Mr. Young about the allocation of D&D costs to its enrichment customers. This allocation is also part of the contractor report, and thus is not yet public. However, Mr. Young did seem to

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indicate that the report confirms that most of the contamination at the GDPs resulted from the initial operation of the plants when used solely for government (defense) purposes. Thus, it might be more equitable to allocate a greater portion of the cleanup costs to the government (taxpayer) for funding. When asked how the customers should pay their portion of the fund, Mr. Young acknowledged that the utilities object to a millage fee because they feel it is not equitable, and DOE has not yet made its policy decision. Kostmayer noted if the Corporation tries to collect either $20 or $40 billion solely through SWU prices, the corporation will be uncompetitive. However, Rep. Sharp's proposal to collect $500 million per year creates a fund of about $20 billion in 15 years, employing earnings attained through pricing as well as the millage fee, if required. DOE either has not, or will not, release any market analysis indicating what the SWU price will be if the Corporation is forced to collect the $20 billion.

Representing the industry, Joseph Paquette, CEO of Philadelphia Electric Company, said the utilities support making a contribution to D&D that is equitable and represents a fair assessment of past usage of the enrichment plants. He explained that the industry opposes a millage fee as a means of collecting the customers' share of the money, because a millage fee does not reflect past services to foreign customers and thus, is not equitable. He also questioned the credibility of the Ebasco Corporation study, indicating it had been done over too short a period of time, and without taking any soil samples. Paquette asked Congress to authorize an independent agency, such as the National Academy of Sciences, to undertake a D&D study. The study should collect more data and look into the causes of the contamination. Rep. Kostmayer agreed that an independent assessment may be valuable. However, as the Academy is not really capable of independent scientific analysis, it would have to hire contractors, or more likely, review data already collected by DOE's contractors.

House Passes Export Administration Act

On October 29, the House passed a bill reauthorizing the Export Administration Act. This bill addresses trade in sensitive technology such as telecommunications and other products listed on the government-regulated COCOM list. The bill contains an amendment (sponsored by Rep. Wolpe) that would severely curtail nuclear trade if it is enacted. The State Department has expressed concern about the amendment, because it believes the change would end nuclear technical assistance to east European countries and would allow trade only with countries with which the USA has a full-scope nuclear cooperation agreement. An additional requirement of the amendment contains probably the most sweeping language yet introduced to limit nuclear trade. This amendment requires the President to impose sanctions on any "country" violating measures adopted by the London Suppliers Group, an organization that establishes international guidelines for nuclear trade. This stipulation would mean that if it were determined that a company sold nuclear technology to Iraq, *all* nuclear trade by the country of origin would be sanctioned, not just the company's trade. This measure would "kill" all of the State Department's current multi-lateral efforts within the London Suppliers Group on dual-use exports, because the amendment mandates US sanctions. If the House bill were to become law, the result would be that the US government would have less influence over trade in these areas, and thus, proliferation concerns could expand.

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Another potentially objectionable area of the amendment concerns the sale of HEU to research reactors. The amendment stipulates that all research reactors convert to LEU. The State Department has explained that not all research reactors are able to convert to LEU, and that requiring the US government to develop alternate fuels is not practical. The amendment does not allow for the possibility that in some countries neither alternative exists, conversion to LEU or alternate fuels, and thus would prevent sales to these countries entirely. If DOE's customers cannot get their HEU from the USA because of this bill, they simply may go to other sources. These customers, consisting primarily of US allies, view this as more US meddling in their domestic policy.

In general, when compared with current law, the proposed amendment limits Presidential discretion when dealing with other countries on nuclear trade. The administration opposes this aspect of the bill as well as some other provisions, such as telecommunication sales to the USSR, and unless the bill is modified, it probably will bring a Presidential veto.

NAS Report on Alternative Uses for AVLIS

During October, the National Academy of Sciences (NAS) released its report on alternative uses for AVLIS. After a two-day briefing last year at Lawrence Livermore National Laboratories (LLNL), eight companies and two federal organizations submitted seventeen alternative AVLIS applications. NAS has apparently reviewed these alternatives, but makes no mention of them specifically in the report. Of the sixteen recommendations made, the primary recommendation is that DOE and the national laboratories "should allow industry to play a greater and an earlier role in the definition and development of the technology, if the USA is to derive significant commercial benefit from research done at the labs." It also suggests that in order to foster technology transfer, industry should "design and manufacture as many components and subsystems as is practical." Another recommendation is that, although the market may have to be created, it appears there are a number of isotopes that can be separated for commercial purposes, including gadolinium, zirconium, hafnium, and carbon. For instance, isotopically pure carbon is used to produce diamonds, which can be used in a variety of industrial processes, such as fabrication of ultrasharp cutting knives for metal machining used in the optics and nuclear industries. Other isotopes derived from the process may have medical or research uses.

The technology developed for AVLIS, such as the laser and separator systems and their components and subsystems, has other industrial uses as well. In particular, the report indicates the technology of handling high-temperature corrosive materials constitutes "a national resource which should be made available to industry." Another recommendation is that LLNL should establish a user facility to provide beam time and technical support for the laser systems. Several chemical companies are already exploring use of the lasers via the Cooperative Research and Development Program that may provide access to the technology. Although the Academy report does not look at nuclear fuel uses for AVLIS, the final recommendation notes that alternative uses for AVLIS could pose a proliferation risk particularly in the production of isotopes of metallic elements.

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INDUSTRY BRIEFS

Taiwan AEC Conditionally Approves New Reactors

Taiwan's Atomic Energy Commission (AEC) has approved the Environmental Impact Assessment for Taiwan Power Company's (Taipower) plan for its seventh and eighth reactors.

The AEC gave its approval based on Taipower's compliance with over 40 conditions. The extensive list of conditions included: a thorough plan to improve safety-related equipment and procedures; improved public trust with full disclosure of safety-related information; improved maintenance and the establishment of a maintenance training center; regular evaluations of plant operations and performance with immediate correction of any deficiencies; more research and development; greater technology transfer; improve staff experience and diversity by bringing in engineers from outside Taipower; revision of its career development program and improving promotion opportunities; and improvement of the openness and fairness of bidding.

Lithuania Concludes Agreement for Operation of 3,000-MWe Ignalina Station

The newly independent state of Lithuania has reached an agreement with the Soviet Union's Ministry of Atomic Energy and Industry for the Ministry to continue its responsibility for the operation, safety, fuel, and equipment for the Ignalina station in Lithuania. Lithuania formally took possession of the Ignalina station August 27, making the Lithuanian Ministry of Energy its new owner. However, the two Ignalina 1,500-MWe RMBKs (graphite-moderated, water-cooled reactors) will remain in the Soviet inventory under Soviet IAEA safeguards, until Lithuania can sign, ratify, and enact the conditions of the Treaty on the Nonproliferation of Nuclear Weapons.

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India Discovers Its Largest Uranium Deposit

India's Department of Atomic Energy announced the discovery of a major uranium deposit at Domiasat, south west of Shillong, in the state of Meghalaya. The sandstone-type deposit covers an area of more than ten square kilometers, ranging in depth from approximately 5 to 50 meters. Ore grades reach as high as 0.41 $^{w}/_{o}$ U_3O_8. The department states this is India's largest and richest deposit yet discovered.

New York-LILCO Agreement Upheld by Highest NY Court

On October 22, the New York Court of Appeals, by a 4-3 decision, upheld the agreement between New York state and Long Island Lighting Co. (LILCO) that allowed LILCO to transfer ownership of the Shoreham nuclear plant to the Long Island Power Authority (LIPA) for the sum of $1.00. The agreement also allows LILCO to recover some of its $5 billion investment from ratepayers over an eleven-year period.

The 809-MWe (net) boiling water reactor was completed but never commercially operated due to public opposition. LILCO has requested, but not yet received, approval from the US Nuclear Regulatory Commission on a decommissioning plan; therefore LILCO, LIPA, and the New York Power Authority cannot yet proceed with full decommissioning efforts on the Shoreham plant.

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Yankee To Keep Rowe, Mass. Plant Shut Down Through April 1992 Refueling

Yankee Atomic Electric Company has decided to keep its 167-MWe pressurized-water reactor at Rowe, Massachusetts shut down through its planned refueling in April 1992, rather than petition the US Nuclear Regulatory Commission (NRC) to allow Yankee to resume operation at the plant before the scheduled refueling. Yankee will use the time to gather data on the embrittlement level of the pressure vessel, in the hopes of satisfying the NRC's concerns about the safety of the oldest operational US commercial reactor.

The NRC is most concerned about the reactor's ability to withstand pressurized thermal shock from the sudden rush of cold water introduced in an emergency cooling scenario. Yankee intends to present a substantial case to the NRC so that the Rowe unit is allowed to operate until the expiration of its license in 2000, and possibly to receive a license extension for operation until the year 2020. The amount of testing and evaluation necessary, as well as the preparation of the evidence for the NRC, may require Yankee to go beyond April 1992 before being allowed to restart. The embrittlement situation at the Rowe unit, and Yankee's and the NRC's handling of the issues is perceived as a test case for future operation and license extensions of many older US reactors.

Uruguay's Plans for 600-MWe CANDU Reactor on Hold

The government of Uruguay has put its plan for an Atomic Energy of Canada, Ltd. (AECL) 600-MWe CANDU-type pressurized, heavy-water reactor on indefinite hold until other energy alternatives can be examined. The government indicated that new energy alternatives have significantly altered its situation, since discussions were initiated with AECL. Paraguay is now offering to sell Uruguay electricity, and Brazil and Argentina are discussing the construction of a natural gas pipeline, which may give Uruguay access to a supply of natural gas.

Uruguay's three million people depend on hydroelectric power for nearly 75 percent of their electricity requirements, but recent droughts have severely hampered normal levels of electrical generation. A plan for a 600-MWe nuclear power plant was initiated with AECL, with Uruguay planning to export excess electricity to Brazil and Argentina.

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Japan Lifts Sanctions Against South Africa

Japan's government recently announced that it has lifted most trade sanctions against South Africa. Removal of these sanctions permits Japanese companies to again purchase South African uranium. Prior to 1988, when Japanese utilities complied with the sanctions, over 10 percent of Japan's uranium imports came from South Africa.

IAEA Gains New Members and Major Countries Agree to Full-Scope Safeguards

Yemen, and the newly independent states of Lithuania, Latvia, and Estonia have been accepted for membership in the International Atomic Energy Agency (IAEA). They still must confirm their membership by depositing instruments of membership with one of the agency's safe-keeping members.

In related matters, France, the United Kingdom, South Africa, and the Soviet Union all have announced they will apply IAEA full-scope safeguards to future agreements. However, prior agreements negotiated without full-scope safeguards, which require the recipient country to open all nuclear facilities to IAEA inspection, might not be changed. Nevertheless, parties to these prior contracts may be encouraged, thought not forced, to comply with full safeguards.

In addition, within the last year, Germany has applied the safeguards, and currently Belgium and Switzerland are considering applying them. China and North Korea now are even more conspicuous in their lack of full-scope IAEA safeguards. China's recent commitment to the sign the Treaty for the Non-Proliferation of Nuclear Weapons (NPT), makes it more likely that the country also would consider applying the safeguards. However, North Korea signed the NPT six years ago, but has not ratified the treaty and still operates non-safeguarded nuclear facilities.

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ANALYSIS AND COMMENTARY

WORLD NUCLEAR GENERATING CAPACITY AND URANIUM REQUIREMENTS TO 2005

The following article summarizes sections of a NUEXCO study entitled Nuclear Fuel Market Analysis and Price Trend Projections, *pertaining to the world's installed nuclear electric generating capacity and consequent uranium requirements. Aggregated information is provided to give an overview of the world situation. Specific data for individual countries and reactors is published in the complete report and is available from NUEXCO Information Services.*

The outlook for the world nuclear power industry through 2005 is more positive than some may believe. Installed nuclear electric generating capacity is forecast to grow at an average rate of 2.4 percent per year, and reach 448 gigawatts electric (GWe) by 2005 (**Figure 1**, on the following page). Consequently, annual world uranium requirements also will grow, reaching over 200 million pounds equivalent U_3O_8 by 2005.

NUCLEAR GENERATING CAPACITY

All countries with announced nuclear power programs are included in the analysis, including the Soviet Union, all former east European countries, and China. **Table 1** below provides a list of all countries included in the analysis, grouped into the indicated regions. Countries not listed are not projected to have an operating nuclear plant before 2005.

To develop the capacity projections, the existing civilian nuclear power programs within each country were examined in reasonable detail. Numerous factors were considered for each country, including:

- Electricity demand growth rates.
- Political and societal environments.
- Financial resources of operating entities.
- National energy plans.
- National construction experience.
- Specific construction plans and schedules.
- Current status and construction progress.
- Construction management expertise.
- Licensing progress and/or backlog.
- Public acceptance of nuclear power.
- Projected plant lifetimes.
- Public utility regulatory considerations.

Table 1
COUNTRIES INCLUDED

Eastern Europe	Western Europe	Far East	United States	Other Countries
Bulgaria	Belgium	China[1]	USA	Argentina
CSFR[2]	France	Japan		Brazil
Finland	Germany	South Korea		Canada
Hungary	Italy	Taiwan		Cuba
Poland	The Netherlands			Egypt
Romania	Spain			India
Soviet Union	Sweden			Israel
Yugoslavia	Switzerland			Mexico
	UK			Pakistan
				South Africa

[1] China: refers to the People's Republic of China
[2] CSFR: Czech and Slovak Federal Republic, formerly Czechoslovakia

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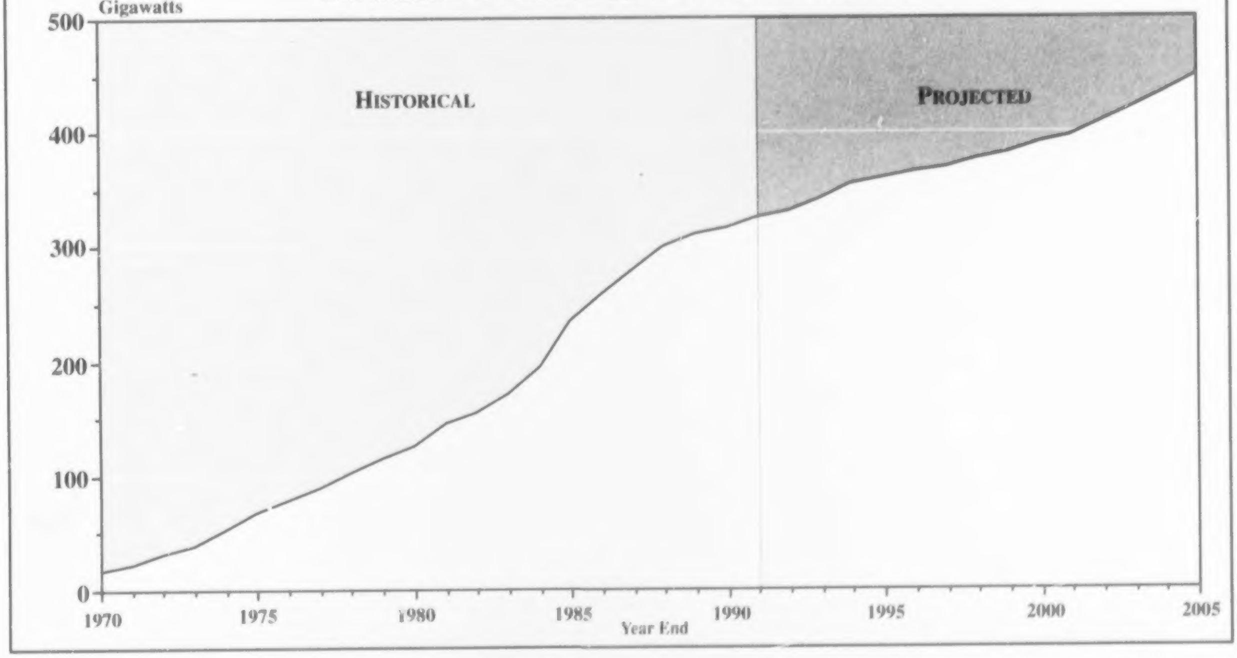
Figure 1
INSTALLED NUCLEAR GENERATING CAPACITY



The relative importance of these factors to the future development of nuclear power varies greatly from one country to another. For instance, in developing countries, financial resources are often the limiting consideration, whereas in highly developed countries, the rate of growth of total electricity demand is limiting. In many countries, nuclear growth is limited by political considerations.

In addition, several inherent uncertainties affect any long-term capacity projections. Some of these uncertainties include:

- The growth rate in demand for electricity. Recent rates of growth have exceeded many expert forecasts.
- Increased recognition by society at large that nuclear power is:
  - A low-risk power source.
  - A much lesser contributor to uncontained environmental pollution than alternate large sources of power (no CO_2-related greenhouse effect, ozone layer depletion, or acid rain problems).
  - A long-lasting source of low-cost energy.
- Substantial progress in the development of inherently safer nuclear power plants that are technically less demanding in construction and operation.
- Licensing reform adopted by the US Nuclear Regulatory Commission, including one-step licensing, site banking, and certification of standardized designs.

After evaluating all of this information, estimates were made for the most probable commercial operation date for reactors planned or under construction. These estimates, as well as estimates of future new units, decommissionings, and cancellations, were combined to produce the total installed nuclear capacity projections.

All projections in the study were made for low growth, high growth, and reference case scenarios. This article summarizes only the reference case. That scenario assumes some slippage of construction progress from announced schedules of reactors under construction, and also assumes that most reactors whose construction has been halted will eventually be cancelled.

As mentioned at the beginning of the article, installed

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nuclear capacity will reach 448 GWe by 2005, growing at an average rate of 2.4 percent per year. As shown in **Figure 2**, the large majority of this capacity is already operating (314 GWe); 73 GWe of capacity is under construction; 29 GWe is planned; and an additional 43 GWe is estimated to be constructed and operational by 2005.

Figure 3 is a bar chart showing net annual additions to installed capacity from 1970 through 1990, and projected through 2005. This figure vividly shows the reduced growth rate of new capacity compared with historical annual additions. The average net annual addition from 1976 through 1990 were 16.5 GWe, and the projected average net annual additions from 1991 to 2005 are 8.9 GWe.

Although growth has slowed from the 1970s and 1980s, particularly in the USA and western Europe, the growth rate in eastern Europe, Asia, and other countries is expected to remain significant. **Table 2** shows the current and projected capacity by region and the respective growth rates through the year 2000.

Reactor Type Projections

As installed capacity grows worldwide, uranium requirements also will grow, but will be affected by the requirement characteristics of the different types of reactors. **Figure 4** shows the historic and projected composition of the world's nuclear capacity by reactor type. The graph indicates that the Boiling Water Reactor (BWR) proportion stays fairly constant in the 1990s, at about 22 percent.

Figure 2
INSTALLED NUCLEAR GENERATING CAPACITY BY CURRENT STATUS

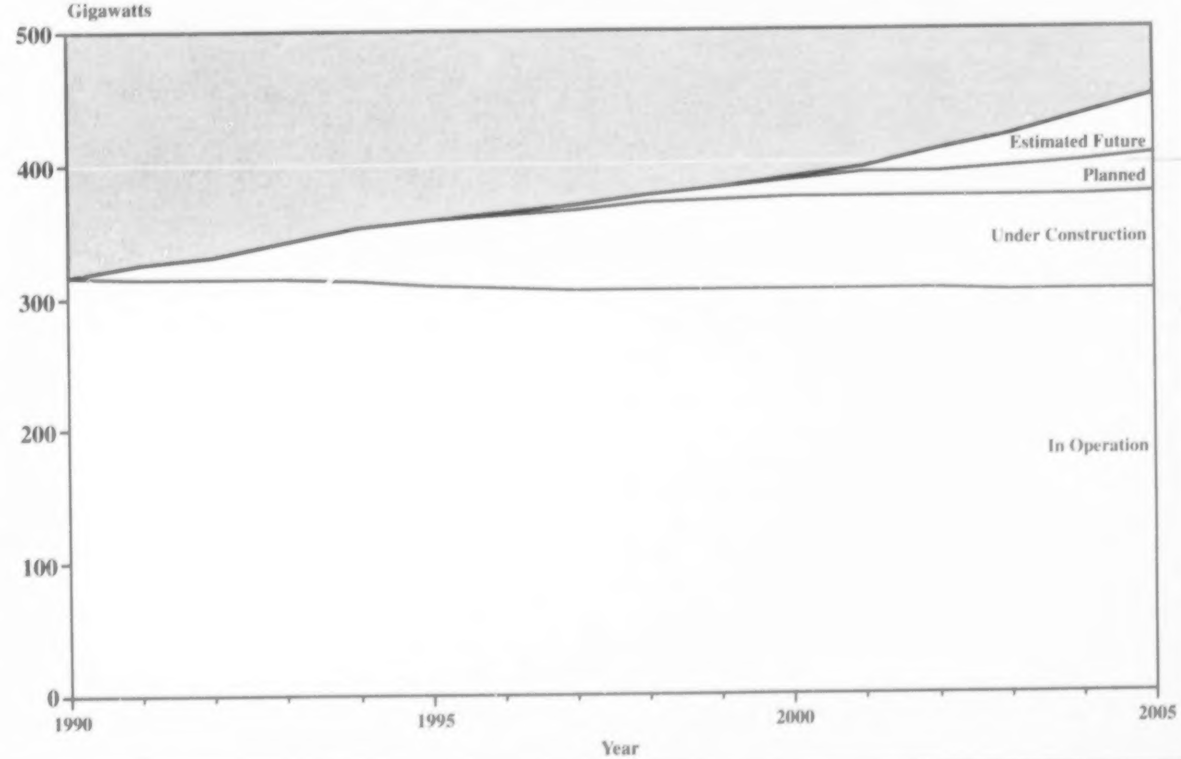

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Figure 3
NUCLEAR GENERATING CAPACITY — NET ANNUAL ADDITIONS

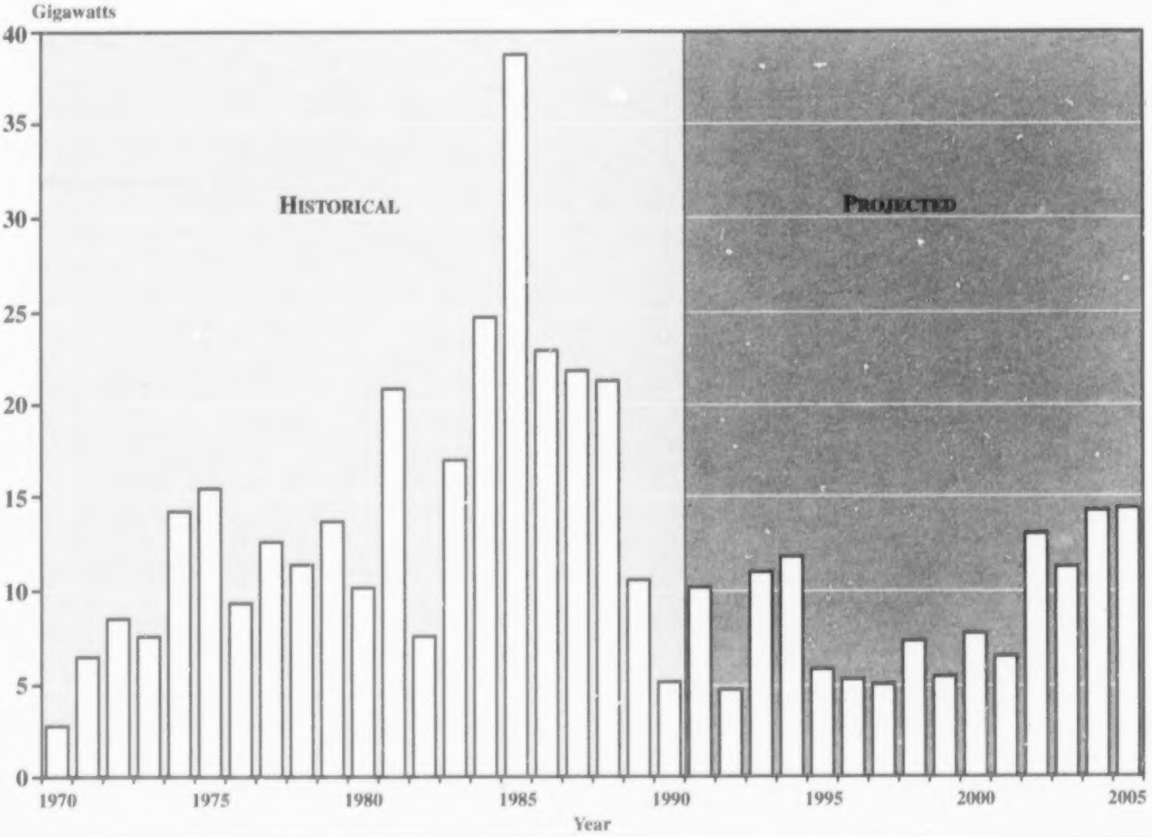

Table 2
EXPECTED GROWTH IN CAPACITY OF NUCLEAR POWER

Region	Capacity GWe		Growth (end of 1990 to end of 2000)		
	1990	2000	GWe	Percent	Percent/Year
Eastern Europe	42.9	69.9	27.0	63	4.9
Western Europe	111.8	126.3	14.5	13	1.2
Far East	42.4	63.5	21.1	50	4.0
United States	99.3	102.8	3.5	4	0.3
Other Countries	18.6	26.2	7.6	41	3.4
Total World	**315.0**	**388.7**	**73.7**	**23.4**	**2.1**

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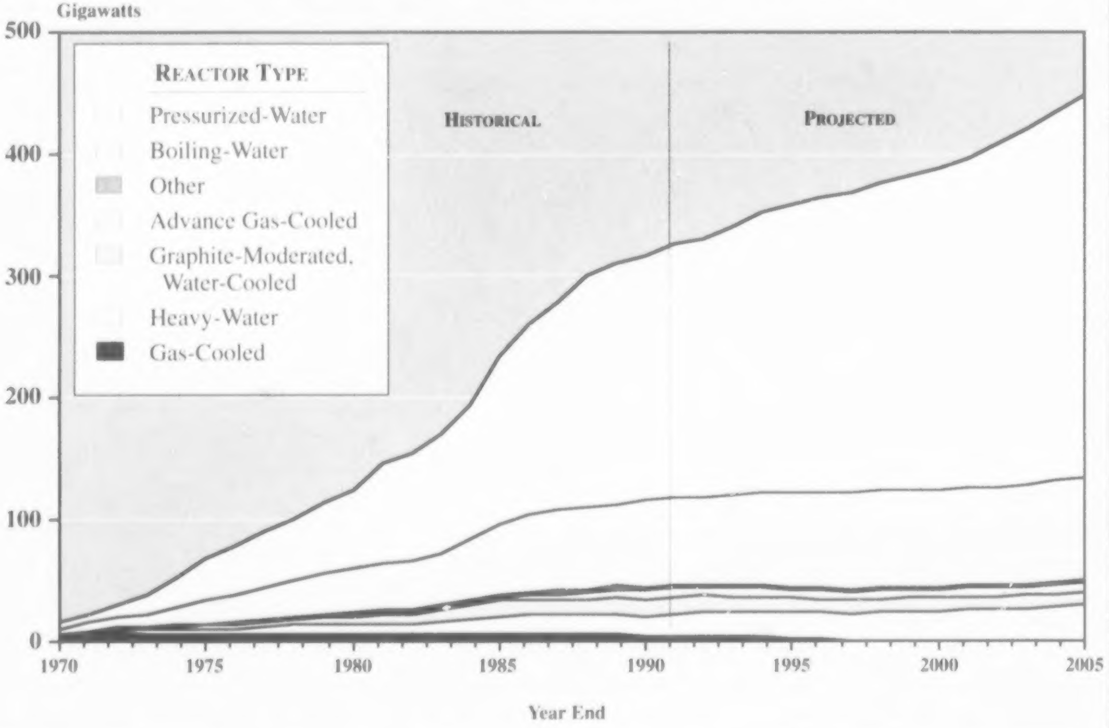
Figure 4
INSTALLED NUCLEAR GENERATING CAPACITY BY REACTOR TYPE



The Gas Cooled Reactor (GCR) share was 3 percent in 1970 and gradually drops out by 1999; the Heavy Water Reactor (HWR) remains fairly steady at about 6 percent; the Advanced Gas Reactor (AGR) emerged in the mid-1970s and remains at a very small share (2 percent). The Pressurized Water Reactor (PWR) carries the largest share of all, rising from 3 percent in the early 1970s, to about 70 percent through 2005.

Capacity Factors

Another significant factor that directly affects projected world uranium requirements is the capacity factor of each reactor worldwide. Reactor capacity factor (CF) is defined as the ratio of actual electric production over a period of time, to the theoretical maximum production that could have been obtained had the reactor operated at full power 100 percent of the time. Plant-by-plant capacity factors throughout the world were compiled and analyzed. The individual reactor capacity factors were processed to yield an average capacity factor for that reactor for the last three years: 1988, 1989, and 1990. These averages were used as the projected capacity factor in 1991 for that reactor. Capacity factors for Bulgaria, CSFR, and the Soviet Union were based on a two-year average of 1988 and 1989.

In order to allow for reasonable future improvements in plant operating reliability, the capacity factor of each reactor is assumed to increase each year as a ramp function toward a maximum feasible capacity factor for that reactor type. This improvement function depends upon the specific characteristics of the reactor, such as whether it refuels on-line or shuts down for refueling. The function also allows for greater increases

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from reactors that have lower average CF's, and smaller increases from high CF plants, to reflect that each incremental improvement in capacity factor becomes more difficult as a plant approaches a maximum feasible capacity factor. **Figure 5** shows the historical and projected average world capacity factor. Projected capacity factors by region for 1991 and 2001 are provided in **Table 3**. These figures are aggregated from a reactor-by-reactor analysis.

Electricity Production

After incorporating all of the different factors to determine nuclear generating capacity, total world electricity production is projected to total 35,500 terawatt hours. **Figure 6** shows the projected cumulative production share by region for 1991 through 2005.

URANIUM REQUIREMENTS

Using the projections for installed nuclear generating capacity and specific reactor capacity factors, as well as calculations of optimal tails assays and fuel burnups, yields projections of world uranium requirements. Compared to previous NUEXCO studies, the projected requirements for fuel materials and services are slightly lower than last year's analysis. This drop is a result of further enhancements made in the calculation model to better reflect changing fuel design burnups and relative enrichment requirements.

Figure 5
HISTORICAL AND PROJECTED NUCLEAR PLANT CAPACITY FACTOR
(Maximum Dependable Capacity Basis)

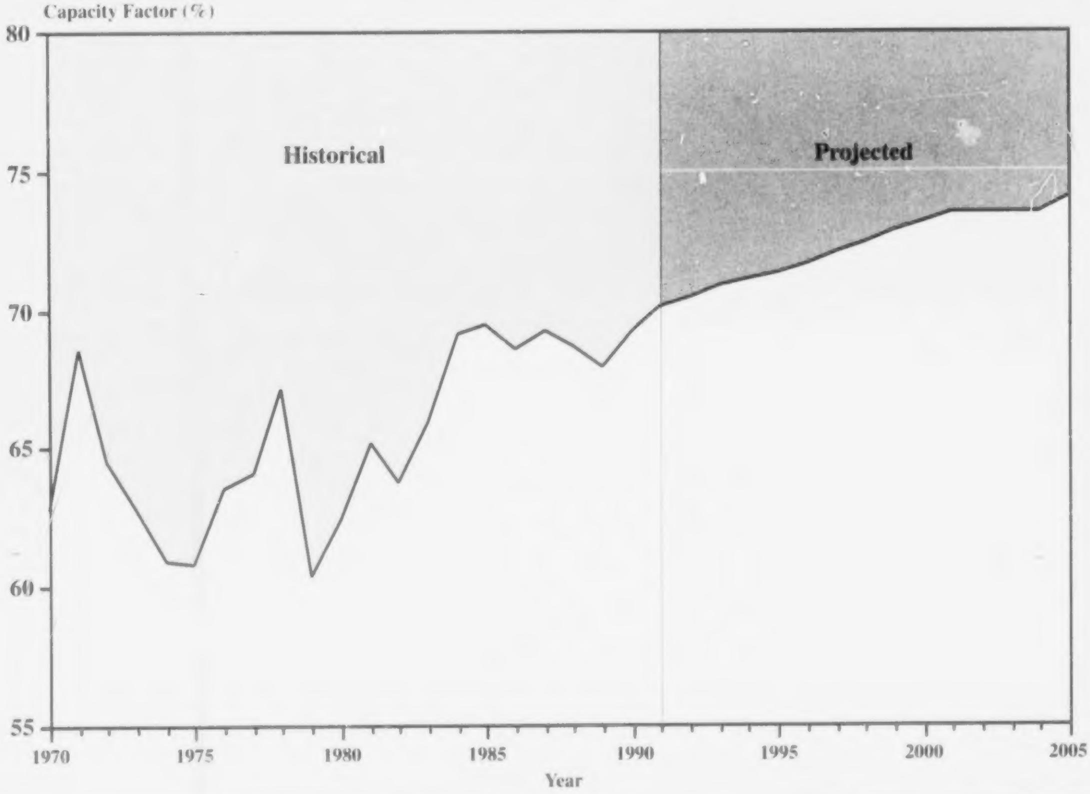

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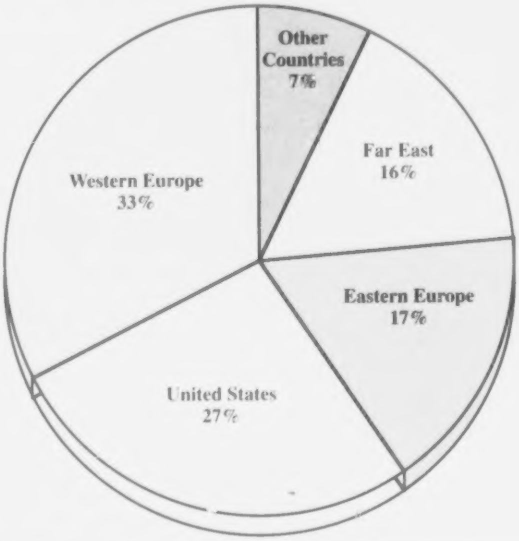
Figure 6
PROJECTED CUMULATIVE NUCLEAR ELECTRIC PRODUCTION BY REGION — 1991 through 2005



The principal factors affecting uranium requirements include:

- Nuclear electric generating capacity in operation, and annual additions.
- Nuclear plant design characteristics:
  - Operating life
  - Core loading
  - Thermal efficiency
- Nuclear plant operating characteristics:
  - Capacity factor
  - Cycle length
- Nuclear fuel characteristics:
  - Fuel assembly design
  - Initial core enrichment and burnup
  - Reload fuel enrichment and burnup
- Fuel cycle characteristics:
  - Enrichment tails assay
  - Recycle of uranium
  - Recycle of plutonium
  - Fuel preparation lead times
  - Fuel processing losses

Table 3
PROJECTED CAPACITY FACTOR BY REGION

	Capacity Factor (%)	
Region	**1991**	**2001**
Eastern Europe	73.0	74.6
Western Europe	69.4	72.7
Far East	73.0	75.6
United States	68.5	72.7
Other Countires	69.2	71.2
WORLD	**70.1**	**73.4**

The uranium requirements calculations include an optimization for enrichment tails assay. The enrichment tails assay in each year is selected so as to minimize the cost of enriched uranium product based on the projected spot price of uranium and the estimated price of enrichment services. In this analysis, the optimization yielded a tails assay in excess of 0.3 weight-percent U^{235} in almost all years. The nominal maximum tails assay allowed by most enrichers is 0.3 weight-percent. Therefore, in keeping with this constraint, a tails assay of 0.3 weight-percent was used consistently in the calculations of requirements.

After considering all of the factors, world requirements are estimated at 150 million pounds U_3O_8 in 1991, 173 million pounds U_3O_8 in 2000, and 205 million in 2005. These are the total requirements, excluding any reductions attributable to current inventory usage or recycling programs. Any excess inventory usage and recovered products from reprocessing are treated as supplementary feed. The projection shows an average annual growth in uranium requirements of 2.2 percent from 1991 through 2005, which is equivalent to about 3.9 million pounds U_3O_8 per year. **Figure 7** shows projected relative uranium requirements for the world. As can be seen in that figure, five countries constitute about 73 percent of the total natural uranium requirements: United States, Soviet Union, France, Japan, and Germany.

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Figure 7
PROJECTED CUMULATIVE NUCLEAR ELECTRIC PRODUCTION BY COUNTRY — 1991 through 2005

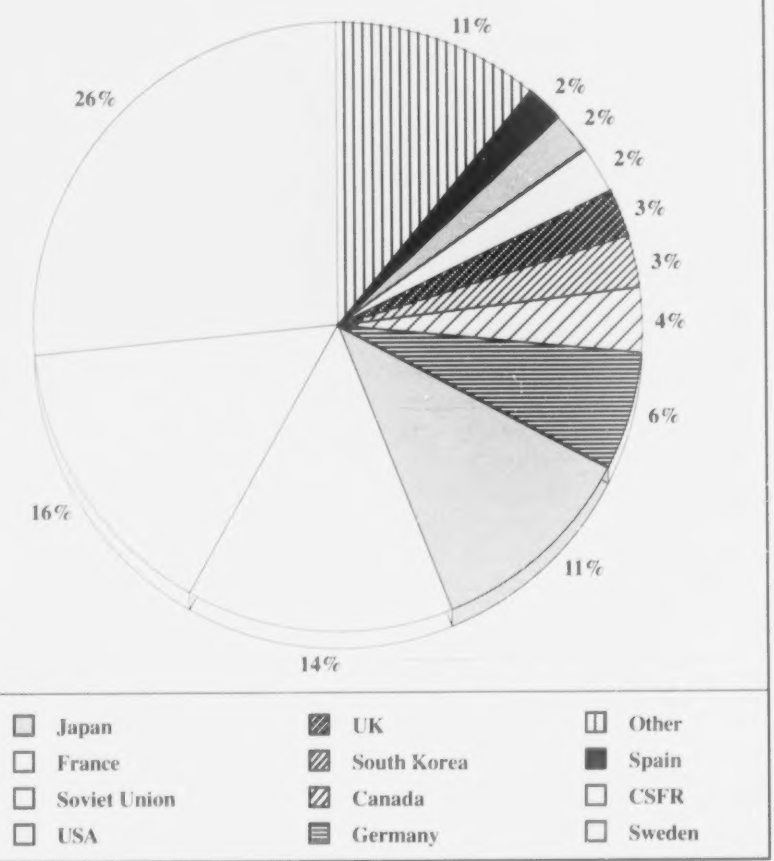

Table 4 lists the projected annual uranium requirements of the world by region for 1991 and 2000. These data show a 5.6 percent annual growth in uranium requirements for Other Countries, 3.0 percent for Eastern Europe, 1.8 percent for the Far East, and only 0.9 percent and 0.3 percent respectively, for Western Europe and the USA, giving 1.6 percent overall for the world. Note that the projection shown is through the year 2000. This reflects the higher degree of accuracy through that time frame, as reactors that come on line by that time likely are already under construction, and therefore completion schedules and expected requirements can be more accurately forecast.

Although nuclear power may not be growing as fast as it was in the 1970s, the outlook for the industry is positive, as growth worldwide continues to provide opportunities. Increased awareness by the public of both the monetary and environmental costs of fossil fuel plants, along with improved reactor designs, suggest that the growth will continue.

Table 4
NATURAL URANIUM REQUIREMENTS

Region	REQUIREMENT Million lbs. equivalent U_3O_8		GROWTH (1991 TO 2000)		
	1991	2000	Million lbs U_3O_8	Percent	Percent/Year
Eastern Europe	29.7	38.9	9.2	31	3.0
Western Europe	46.3	50.3	4.1	9	0.9
Far East	23.3	27.4	4.1	18	1.8
United States	43.5	44.9	1.4	3	0.3
Other Countries	7.0	11.6	4.5	65	5.6
Total World	**149.7**	**173.0**	**23.3**	**16**	**1.6**

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HUNGARY:

MEETING ELECTRICITY NEEDS WITH NUCLEAR POWER

BACKGROUND

Following Poland, Hungary was the second east European country to embrace democracy and adopt major reforms. On March 25, 1990, Hungary held its first free national elections in over 40 years. The country has experimented with free market concepts for a number of years, and its new government favors rapid economic integration with western Europe. Hungary has one of the strongest industrial bases in all of eastern Europe, and industrial output accounts for over 50 percent of the country's gross domestic product. However, inefficient use of energy throughout all sectors of the country has made Hungary dependent on energy imports.

This reliance on energy imports makes the role of nuclear power even more important in Hungary. The government has recognized the importance of improving the efficiency of its energy use and reducing its dependency on energy imports, and is carefully examining nuclear power as a means to achieve that goal. Hungary's nuclear power station at Paks already accounts for about half the country's total domestic electricity generation.

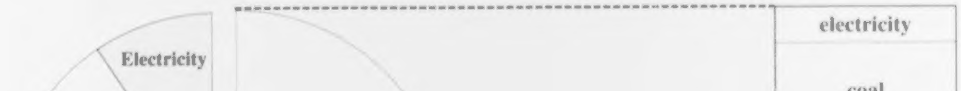
Hungary also faces enormous economic challenges, including high foreign debt, high inflation, lagging wage increases, and rising unemployment. Nevertheless, the country's industrial base, the government's firm commitment to democracy, and previous experiments with market reforms make Hungary better situated than other former East Bloc countries to make the difficult transition to a market economy.

ENERGY SITUATION

Hungary's energy situation is comparable to the overall condition of the entire country, in that it has a number of assets but some challenges as well. The two major energy challenges facing Hungary are an inefficient use of energy and a dependency on energy imports.

Hungary's limited natural resources have caused the country to become economically dependent on foreign trade and to import nearly 50 percent of its energy (**Figure 1**). While Hungary is not overly dependent on any one source of energy, it is compelled to import all types of energy,

Figure 1
HUNGARY'S ENERGY CONSUMPTION



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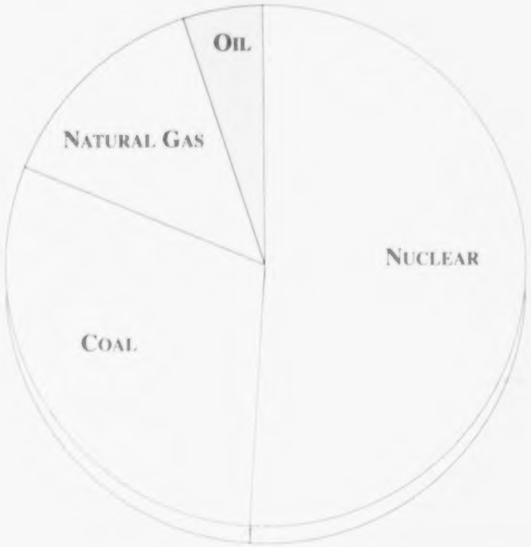
including coal, oil, gas, and electricity. Over 95 percent of Hungary's energy imports come from the Soviet Union, but this presents another challenge. Due to the Soviet Union's own energy problems, it has announced plans to reduce its exports by 30 percent or more in upcoming years. To prevent a shortfall of energy imports for 1992, Hungary already has signed a contract with the Soviet Union to pay hard currency for 4 to 5 million metric tons of oil, 6 to 6.5 billion cubic meters of natural gas, and 8 million MWh of electricity. These imports should satisfy most of Hungary's needs for the upcoming year.

To improve its domestic supply in the near term, Hungary's power plants have been upgraded with new boilers or turbogenerators to improve their efficiency. As a result, many plants now are operating at nameplate capacity, instead of being downrated by 20 to 30 percent, or more. For the long term, additional generating plants are planned.

Figure 2
1990 DOMESTIC ELECTRICITY GENERATION SHARE BY SOURCE



While Hungary's strong industrial base is an asset, most of its industries are very energy intensive, such as the steel industry. Thus far, the government's efforts to improve the efficiency of existing industries have proven successful, as the industrial sector currently consumes 10 percent less energy than only a few years ago. But even with additional gains in efficiency, overall energy demand is projected to grow at a *net* rate of 1.0 to 1.5 percent per year during the 1990s, with a large portion projected as growth in electricity demand.

ELECTRICITY

Electricity consumption currently accounts for 12 to 13 percent of total energy demand in Hungary. The country's most important source of electricity is nuclear power, accounting for just over 50 percent of all domestic electricity generation (**Figure 2**). Coal is the next most important source, fueling about one-third of the country's domestic electricity generation. But due to low-grade domestic reserves, much of Hungary's coal must be imported.

Total net energy growth is expected to remain at modest levels, but demand for electricity is expected to grow much

Table 1
HUNGARY'S MAJOR POWER STATIONS

Power Station	Fuel	Station capacity (MWe)	1989 electrical generation (GWh)
Ajka	coal	112	818
Borsod	coal	172	870
Budapest	oil and gas	131	645
Dunamenti	oil and gas	1,870	3,245
Gegarin	lignite	800	2,769
November 7	coal	100	237
November 7	gas	170	9
Oroszlány	coal	235	1,195
Paks	nuclear	1,710	13,891
Pécs	coal	228	892
Bánhide	coal	100	492
Tiezapalkonya	coal	255	1,283
Tieza IL	oil and gas	860	1,975
Total		**6,743**	**28,321**

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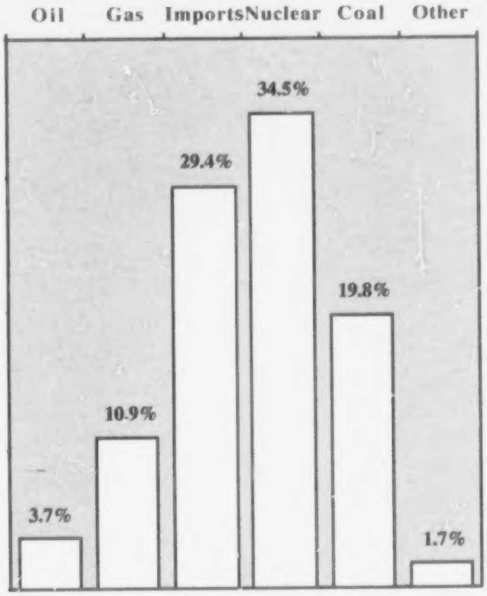
Figure 3
TOTAL ELECTRICAL SUPPLY
BY SOURCE



more rapidly, as Hungary's market reforms improve the economy. Forecasts indicate electrical demand will climb to 48 million GWh by 2005—a 33-percent increase from 1988 levels. That translates to an additional 5,000 MWe of capacity. This additional capacity takes on greater significance when compared to Hungary's existing electrical generating capacity, which totals less than 7,000 MWe. **Table 1** lists the major power stations in Hungary and their generating capacities.

As shown in **Figure 3**, the majority of Hungary's electricity supply is either nuclear-generated or imported. The associated **Figure 4** shows how the industrial sector consumes the greatest share of the total. Through improved efficiencies, industry's share is declining, but this sector remains the focal point of the government's conservation programs.

As the transition toward a market economy creates the need for new capacity, the freedoms of democracy also can bring new challenges. For example, an 890-MWe hydroelectric project on the border between Hungary and the Czech and Slovak Federal Republic, known as the Nagymaros project, was initiated in 1977. But by 1989, this project was stopped by environmental opposition, and was later abandoned. Hungary's 430-MWe share of the potential power generation from Nagymaros is sorely missed.

Figure 4
ELECTRICAL CONSUMPTION BY SECTOR

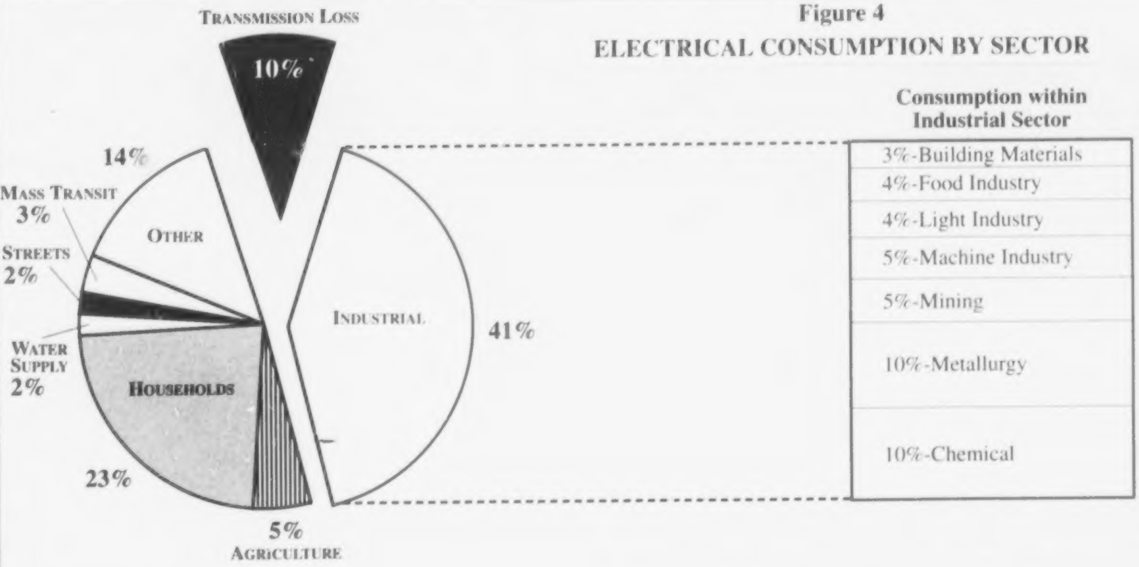


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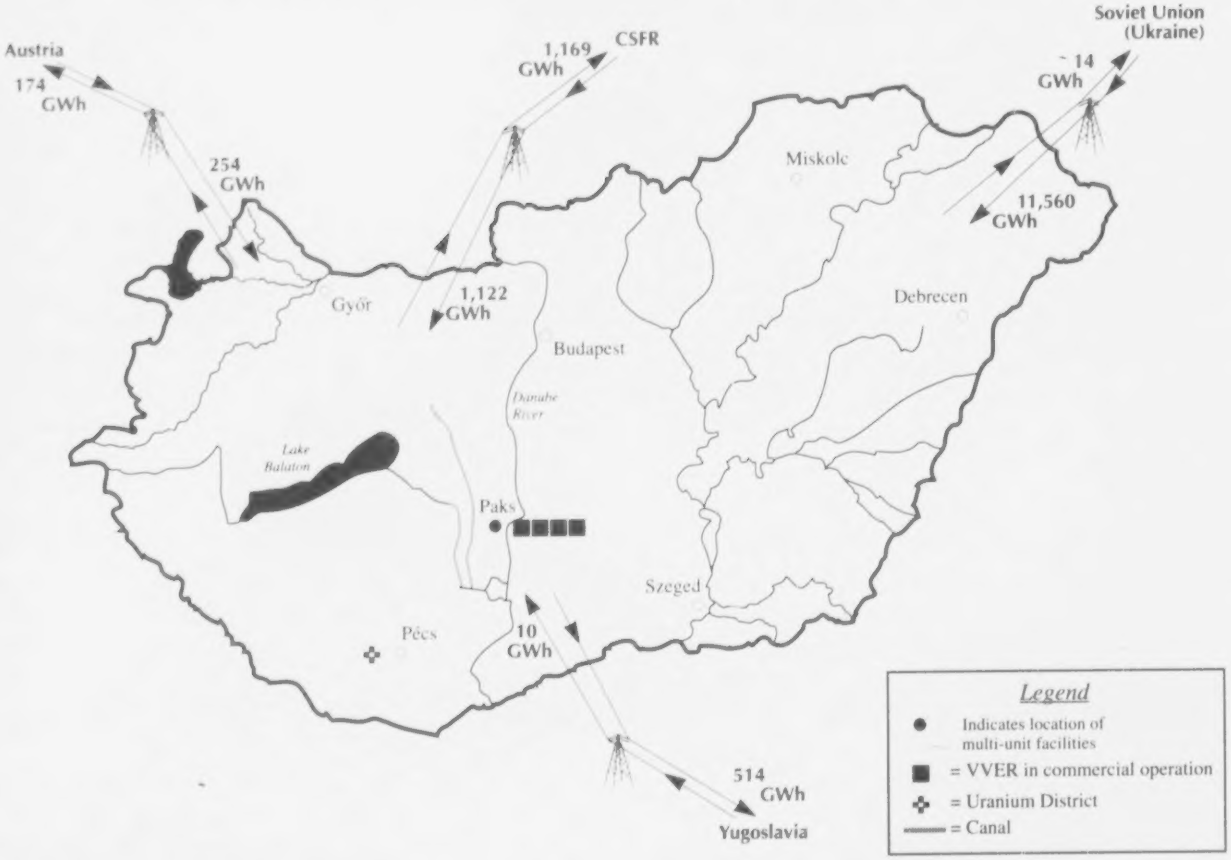
Figure 5
HUNGARY'S FUEL CYCLE FACILITIES AND ELECTRICITY IMPORTS/EXPORTS


Austria
174 GWh
254 GWh
1,169 GWh
CSFR
1,122 GWh
Soviet Union (Ukraine)
~ 14 GWh
11,560 GWh
Miskolc
Győr
Debrecen
Budapest
Danube River
Lake Balaton
Paks
Szeged
Pécs
10 GWh
514 GWh
Yugoslavia
Legend
● Indicates location of multi-unit facilities
■ = VVER in commercial operation
✣ = Uranium District
—— = Canal

Furthermore, Hungary now is committed to supply power to Austria, which helped Hungary finance the Nagymaros project. Hungary intends to fulfill the contract, but has not yet determined where it will get the power.

In an effort to cut demand, the government recently raised electricity prices by over 44 percent. Since it also is committed to eliminating price subsidies on electricity, even greater price increases are likely in the future. The US Agency for International Development recently granted US$10 million in aid to help Hungarians adjust to the higher electricity bills, and to encourage further price reforms.

Imports/Exports

Hungary is dependent upon imports for about 30 percent of its total electricity supply. The map in **Figure 5** illustrates the turnover of electricity in Hungary. By far the largest volume of imports come from the Soviet Union, providing almost 12 thousand GWh in 1989. Most of this power comes from the Ukraine from power plants built jointly with the Hungarians. While Hungary both imports power from and exports power to the Soviet Union, Austria, the Czech and Slovak Federal Republic (CSFR), and Yugoslavia, net imports exceed 11 thousand GWh.

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Hungary plans to be connected to western Europe's electricity grid by 1993 or 1994, both to provide near-term access to a diversity of electricity supplies for import, and for the long term, to provide a means of exporting electricity for revenue. EdF's president, Pierre Delaporte, in a 1990 interview (see NUEXCO Monthly Report #262, June 1990, p. 31) compared Hungary to Switzerland, saying that Hungary was geographically in an excellent position to become a central point of a unified European electricity grid. M. Delaporte stated that a new power plant project in Hungary "would have major geopolitical significance, because there no longer would be just a few transmission lines, but a major bridge between East and West..."

Given Hungary's dependence on energy imports, it is likely the government will elect to install some new capacity before the end of the decade. Forecasts project about 1,300 MWe of gas-fired capacity will be added by 2005, but that still leaves unidentified the source of several thousand megawatts of needed capacity. The government has examined many options, but has not yet decided when to install new plants or if they should be nuclear- or fossil-fueled. A decision on plans for new capacity is expected in 1992.

NUCLEAR POWER PROGRAM

Like the nuclear power programs of other former COMECON countries, Hungary's program was begun in the 1970s in cooperation with the Soviet Union. The Hungarian Electricity Board (Magyar Villamos Müvek Tröszt) oversees all of the country's power plants, including Paks; the station is operated by the state-owned utility, Paksi Atomerőmű Vállatat (PAV). Currently, four reactors are operating at the station, each a 440-MWe (gross) VVER (**Table 2**). The Paks station accounts for only about one quarter of Hungary's total installed electric capacity, but generated 51 percent of all domestically produced electricity in 1990. That percent contribution to total generation is among the highest in the world,

Table 2
NUCLEAR POWER UNITS IN HUNGARY

Units In Operation

Unit	Lead Utility or Fuel Buyer	Capacity (MWe Net)	Type	COD[1]	1990 Capacity Factor (percent)	Total 1990 Electricity Generation (GWh net)
Paks 1	MVMT[2]	415	VVER	1983	88.5	3,217
Paks 2	MVMT	425	VVER	1984	89.7	3,338
Paks 3	MVMT	435	VVER	1986	85.9	3,273
Paks 4	MVMT	435	VVER	1987	80.4	3,065
Total		**1,710**		*(1990 Average:*	**86.1)**	**12,893**

Units Planned[3]

Unit	Lead Utility or Fuel Buyer	Capacity (MWe Net)	Type	COD[1]	Percent Complete
Paks 5	MVMT	900	PWR	2000	planned
Paks 6	MVMT	900	PWR	2002	planned
Total		**1,800**			

[1] COD = Commercial Operation Date (actual or expected)

[2] MVMT = Magyar Villamos Müvek Tröszt (Hungarian Electricity Board)

[3] The two units planned are PWRs to be built with the assistance of an EdF-led consortium. However, no final selection has yet been made, and a proposal for CANDU HWR units built with Canadian assistance is also under consideration, as well as proposals from several other groups.

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lagging only France (75%) and Belgium (60%), and comparable to South Korea (49%). The Paks station performs extraordinarily well, and units 2 and 4 are consistently listed among the top ten reactors in the world when judged on load factor. The entire station has a remarkable lifetime capacity factor exceeding 86 percent.

The original contract for Paks was signed in 1966 and the preliminary construction began in 1968, but was stopped two years later because oil-fired stations were more economical. After the oil crisis of the mid-1970s, construction at the Paks station resumed. This delay actually was fortuitous, for during those years a second-generation VVER was developed (Model 213). This is an important distinction, as first-generation units (Model 230) do not meet current safety standards. First-generation plants at Greifswald in the former East Germany have been shut down permanently, and Bulgaria's Model 230s have been scrutinized by the international community and identified with a number of safety deficiencies. The second-generation VVERs at Paks include containment features, and independent and redundant core cooling systems similar to Western-designed reactors, features that enable the reactors to be upgraded successfully to meet higher safety standards.

PAV brought its first reactor at the Paks station into commercial operation in 1983. Successive reactors were brought into operation in 1984, 1986, and 1987. All of the Paks reactors run on twelve-month cycles, typically shutting down sometime each summer for maintenance and for refueling one-third of the core.

Future Plans

A majority of Hungarians prefer nuclear power because of its excellent operating record in Hungary and because of the severe pollution problems caused by outmoded fossil fuel plants. While some anti-nuclear opposition is emerging, it is not as strong as in other east European countries, even though the Chernobyl accident occurred not far from Hungary's borders. With the country's projected demand growth, two more reactors were planned for the Paks station, each a 1,000-MWe VVER from the Soviet Union; however those plans were cancelled in late 1990 because the government wished to examine other alternatives.

Hungary now has begun anew by soliciting offers worldwide for new plant capacity. Negotiations appear to be most active with a consortium led by Electricité de France (EdF) and PREAG of Germany, which has offered to supply two 900-MWe Pressurized Water Reactors (PWR) of French-German technology. The consortium would provide about 70 percent of the financing, and electricity exports, equivalent to half the plants' production, would be used to repay this construction loan.

Another alternative under serious consideration is an offer from Atomic Energy of Canada, Ltd. (AECL) and Ontario Hydro to supply four, 450-MWe CANDU reactors. The Canadian government, AECL, and Ontario Hydro have been working closely with the Hungarians for over a year. The Canadian government already has indicated it likely would approve loans to Hungary for funding this project. Several other offers have also been received, including a proposal from Switzerland's ABB Atom, a joint proposal from Finland's Imatron Voima Oy (IVO) and Atomenergoexport of the Soviet Union, and an offer from a consortium of Westinghouse (USA), Bechtel (USA), Ansaldo (Italy), and INITEC, ENSA, and ENUSA (Spain).

Regardless of the type of plant or reactor supplier selected, Hungary's limited supply of hard currency will require financing the plants' construction through loans from the supplier, with repayment in the form of electricity exports.

In other nuclear-related developments, Hungary formed the Hungarian Nuclear Society near the end of 1990. The Hungarian government also signed a cooperation agreement with the USA on the safe and peaceful uses of nuclear power. The agreement will make it easier for US nuclear vendors to supply nuclear equipment, technology, and technical support to Hungary.

Internally, Hungary has restructured its governmental regulation of nuclear power. The country's Atomic Energy Commission (AEC) became an independent body effective January 1, 1991. The AEC is the country's nuclear regulatory agency and formerly had been supervised by the Ministry of Industry and Trade, which also supervised operations at the Paks station. Granting the Commission autonomy is a positive move, allowing more objective reviews and critiques of performance at Paks. These reviews, combined with current safety improvement programs from the International Atomic Energy Agency and the World Association of Nuclear Operators, and with the experience gained at IVO's VVERs in Finland, are helping safety efforts at Paks to rise quickly to international standards.

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Fuel Supply

Like other east European countries, Hungary had purchased all its fuel cycle services from the Soviet Union under bilateral trade agreements. With the breakdown of those agreements, PAV in Hungary, like utilities in the CSFR and Bulgaria, renegotiated their fuel supply contracts with the Soviet Union in 1990.

Until January 1991, PAV purchased all its fuel, including its natural uranium, from the Soviet Union. When in late 1990, the Soviets stopped purchasing uranium produced from Hungary's sole uranium mine, the Hungarian government directed PAV to purchase its uranium feed domestically. As a result, new contracts were negotiated allowing PAV to buy its U_3O_8 from a Hungarian source, and to purchase its conversion, enrichment, fabrication, and back-end fuel cycle services from the Soviet Union at competitive prices.

The contract signed earlier this year with Atomenergoexport (AEE), covers the fabricated fuel requirements for all four units for the entire operational life of the Paks station. The terms also contain a provision by which AEE will take the spent fuel from Paks. Competing Western fuel supply offers to Paks did not offer any such provision. Unlike past arrangements, payment for the services will be negotiated annually and must be made in hard currency.

URANIUM RESOURCES AND PRODUCTION

Only one exploitable uranium deposit exists in Hungary. The Pécs uranium project is located in the southern part of the country on the western flank of the Mecsek Mountains (**Figure 5**). It lies 15 to 18 km west of the city of Pécs. The deposit was discovered in 1952 by a Hungarian-Soviet uranium exploration joint-venture. Mine development began shortly after the deposit was confirmed, and production began in 1956. The mining project is operated by the Mecsek Ore Mining Company, a state-owned organization. In recent years, as many as 8,000 people were employed at the project and in other support areas, although production cutbacks and layoffs have reduced that number by at least half.

In 1990, the Hungarian government decided to shut down the mine by 1992 because of uneconomical operating costs. However, earlier this year, the government reversed its decision and agreed to continue to subsidize production, because the costs of subsidies were substantially less than the cost of worker retraining, unemployment compensation, and decommissioning of the site. Production is expected to continue at least through 1994.

Mineralization

Ore mineralization at Pécs is lenticular and occurs in permian sandstone. The thickness of the formation containing the productive lenses ranges from 10 to 50 meters. Size of lenses range from a few hundred tons to tens of thousands of tons. Similarly, the thickness of the orebodies also varies widely, ranging from 0.5 to 5 meters. The ore grade of the original reserves averaged 0.2 weight-percent (w/o) U_3O_8, but showed substantial variation within individual lenses.

Reserves

Between 1956 and 1990, 49 million pounds U_3O_8 were produced from the Pécs project at an average grade of 0.08 w/o U_3O_8. Remaining reasonably assured resources (RAR) total 5.6 million pounds U_3O_8, with an average grade of 0.125 w/o U_3O_8. Estimated additional resources exceed 28 million pounds U_3O_8 at 0.116 w/o U_3O_8. Economically, only about 4 million pounds U_3O_8 of the RAR is recoverable at less than $30 per pound U_3O_8.

Production

Uranium ore is mined by conventional underground methods using a series of shafts at intervals along the strike of the orebody. Each of these shafts is operated individually as a mine unit. Shaft depth has reached 1,100 meters; average operational depth is 600 to 650 meters. Mining progresses downward, employing the methods of room-and-pillar and open stoping.

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Ore is defined radiometrically, then blasted and hauled to the surface by an underground railway system to a central dumping location. Trucks then deliver the ore to the processing plant (mill) at the southern flank of the mining area, approximately 1.5 km away.

All ore from the deposit is fully processed in the company's own mill that began operation 25 years ago. The mill uses radiometric sorting followed by hydrometallurgy, and produces $Ca(U_2O_7)$. Production has ranged from 1.0 million pounds U_3O_8 per year to a peak of 1.8 million pounds, recently averaging about 1.3 million pounds annually.

One to two percent of production comes from surface heap leaching using sodium carbonate solution, as opposed to sulfuric acid hydrometallurgy. Low-grade ore and the rock rejected from radiometric sorting are treated together by this method.

Uranium Marketing

Through 1990, Mecsek sold all production from the Pécs project to the Soviet Union under a bilateral trade agreement. This contract with the Soviet Union was a U_3O_8 supply contract unrelated to any fuel cycle services contract between PAV and the Soviet Union to fuel the Paks station.

In 1990, the Soviet Union indicated it no longer would purchase Hungary's uranium. With the loss of its only customer, Mecsek had few alternatives. The first was to shut down and leave thousands of people unemployed. Another option was to export; however, the market price of uranium was below production cost. The Hungarian government decided that the third option—to sell Mecsek's uranium to PAV—was the most feasible. Consequently, the state's nuclear utility began to purchase all of its uranium feed from Mecsek. PAV then renegotiated its contract with the Soviet Union allowing the utility to provide Hungarian U_3O_8 as feed.

Since PAV is not obligated to continue purchasing Mecsek's uranium, the mining company now is working to improve its efficiency and reduce its production costs, so it can remain a supplier to PAV and also become competitive in the world uranium market. To accomplish this goal, in 1990 Mecsek began negotiating a joint venture with Glencar Exploration plc. of Ireland, in which Glencar would first provide technical assistance to Mecsek, and later begin managing the Pécs operation.

Company Structure

Mecsek's company structure consists of several units, including the head office; mines 3, 4, and 5 (mines 1 and 2 are depleted); the processing plant (mill); and storage facilities. In addition, Mecsek is involved in numerous other activities, including:

- Geological, hydrogeological, and geophysical surveying and mapping.
- Deep drilling for ore, water, and geological structure exploration.
- Steel and steel alloy foundry.
- Manufacturing of rubber and rubber-coated products.
- Manufacturing of split rock bolts.
- Mixing of ammonium nitrate-fuel oil blasting materials.

The company also has its own heating, water supply, and pneumatic plants.

SPENT FUEL STORAGE

At this time, spent fuel from the Paks station is returned to the Soviet Union for storage and disposal. However, the uncertainty of how long the Soviet Union or the Republic of Russia will continue to accept spent fuel has led Hungary to examine interim spent fuel storage options. For example, the EdF-led consortium's offer to build two PWRs at the Paks station includes allowances for taking back spent fuel. Canada has already sent experts to Hungary and is examining the feasibility of a potential waste storage site below the Pécs uranium mine once it is shut down. Preliminary studies have indicated that a site below the Pécs mine could be geologically sound for a repository. The Hungarian government is expected to solicit offers on dry storage technology and site proposals from Western vendors by year end.

CONCLUSION

As Hungary's economy and energy needs begin to expand, nuclear power will play an important role. The country's experience and high degree of success with its nuclear program have established nuclear power as a viable option to reduce the country's dependency on energy imports and to provide capacity to meet future demand.

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NUCLEAR INDUSTRY CALENDAR

1991	
Dec. 2-4	***PLEX '91 BERLIN – Nuclear Plant Life Extension, Upgrading, Repair, Refurbishment, Uprating and Ageing*** (Hotel Steigenberger, Berlin, Germany). Sponsored by Nuclear Engineering International. Contact: Conference (PLEX); Status Meetings Ltd., Festival Hall, Petersfield, Hampshire, GU31 4JW, UK; Phone: 44-730-66544; Fax: 44-730-68865; Telex: 86105 CONFER G.
1992	
Feb. 23-25	***INFO Centers Workshop*** (Marriott Hotel, Palm Beach Gardens, Florida). Sponsored by the U. S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
March 22-25	***Fuel Cycle Conference '92*** (OMNI Charleston Hotel, Charleston, South Carolina). Sponsored by the U. S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
April 12-16	***8th Pacific Basin Conference*** (Taipei, Taiwan). Sponsored by the American Nuclear Society. Contact: ANS Meetings Department; 708-352-6611.
April 26-28	***INFO '92 Conference*** (OMNI Charlotte Hotel, Charlotte, North Carolina). Sponsored by the U. S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
May 5-7	***Annual Meeting on Nuclear Technology '92*** (City Conference Hall, Karlsruhe, Germany). Sponsored by the German Nuclear Society and the German Atomic Forum. Contact: Congress Office JK'92; INFORUM GmbH, Heussallee 10, W-5300 Bonn 1; Phone: 0228-507-223.
Sept. 20-23	***International Uranium Seminar '92*** (Hyatt Regency Hotel, Lake Tahoe, Nevada). Sponsored by the U. S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 21-23	***Second International Conference on Training for Operation & Maintenance in the Nuclear Industry*** (The Moat House International Hotel, Stratford-upon-Avon, United Kingdom). Sponsored by the Institution of Nuclear Engineers. Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.
Nov. 15-18	***Nuclear Energy Forum*** (Fairmont Hotel, Chicago, Illinois). Sponsored by the U. S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

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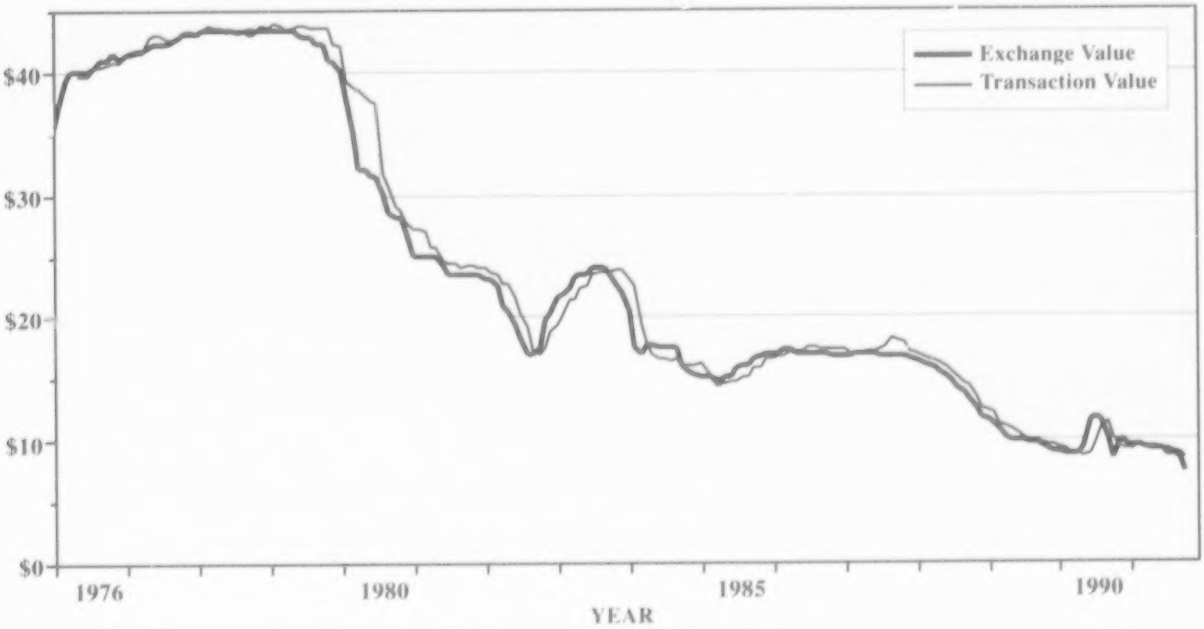
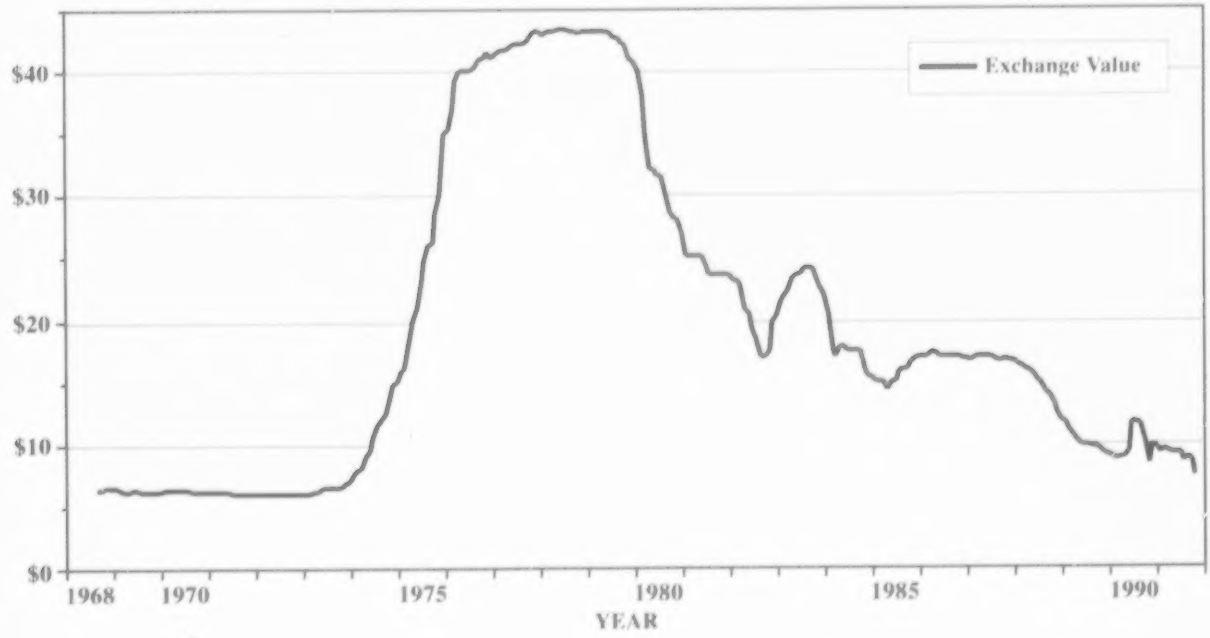
NUEXCO HISTORICAL EXCHANGE VALUE AND TRANSACTION VALUE

(in US dollars per pound U_3O_8)





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HISTORICAL MARKET VALUES

Exchange Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	9.80	9.70
1991	9.10	9.50	9.30	9.10	9.20	9.05	8.55	8.75	8.40	**7.25**		

US Premium (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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UF_6 Values

Determined as of the last day of the month indicated (\$US/kg U as UF_6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29.50	24.75	28.75	28.75
1991	27.50	27.75	27.50	27.25	27.60	27.25	25.75	26.25	25.50	**22.75**		

US Premium (Relative to the UF_6 Value)

Determined as of the last day of the month indicated (\$US/kg U as UF_6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

Conversion Values

Determined as of the last day of the month indicated (\$US/lb U as UF_6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
1991	1.45	1.45	1.45	1.45	1.50	1.50	1.50	1.60	1.55	**1.55**		

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HISTORICAL MARKET DATA

Transaction Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	9.30	9.15
1991	9.40	9.45	9.35	9.30	9.30	9.20	9.15	8.95	8.70	**8.35**		

SWU Values

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	51	51
1991	51	50	52	52	54	59	66	67	67	**68**		

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Loan Rates

Determined as of the last day of the month indicated (Percent per Annum)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4 00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1991	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	**3.50**		

* Float with Prime Rate

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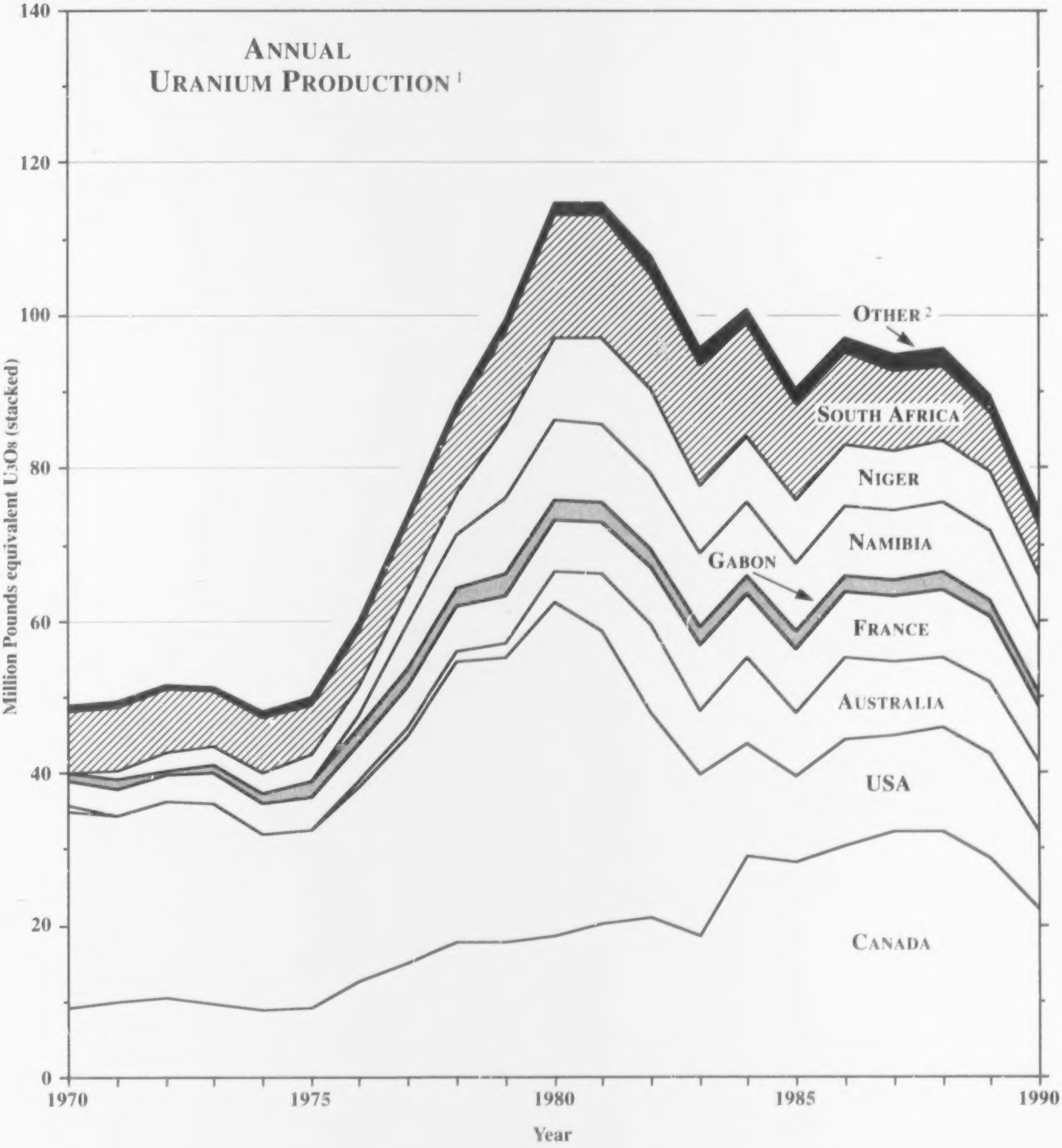

ANNUAL URANIUM PRODUCTION[1]

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[1] Estimated world uranium production in 1990 totalled 85.2 million pounds equivalent U_3O_8 — (Australia: 9.1 – Canada: 22.0 – France: 7.4 – Gabon: 1.8 – Namibia: 8.0 – Niger: 7.4 – South Africa: 6.4 – USA: 10.2 – Other[2]: 2.2)

[2] **Other** includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, western Germany, and Yugoslavia

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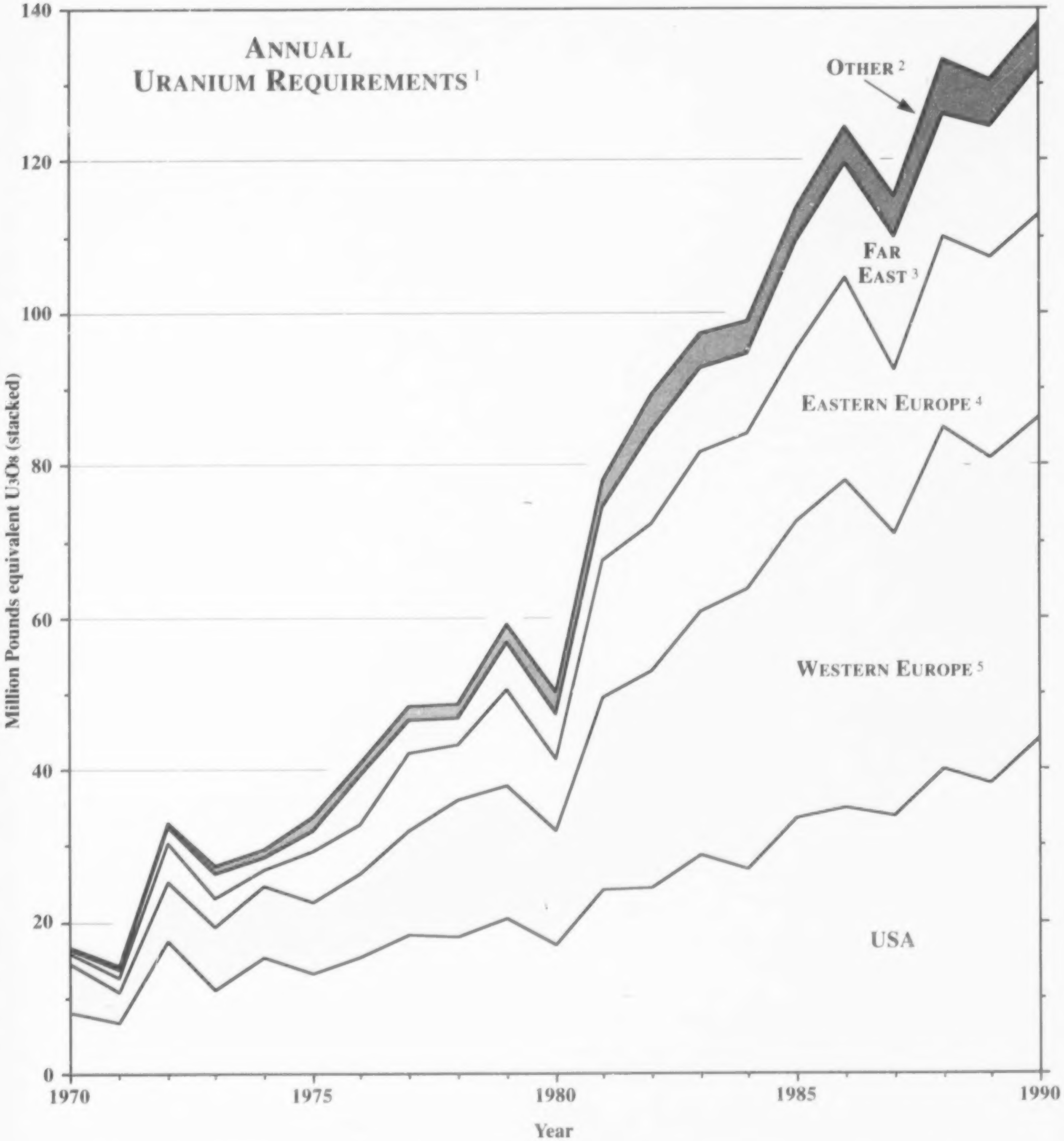

[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assay.

[2] **Other** includes: Argentina, Brazil, Canada, India, Mexico, Pakistan, and South Africa.

[3] **Far East** includes: Japan, People's Republic of China, South Korea, and Taiwan.

[4] **Eastern Europe** includes: Bulgaria, Czechoslovakia, E. Germany, Finland, Hungary, USSR, and Yugoslavia.

[5] **Western Europe** includes: Belgium, France, W. Germany, Italy, The Netherlands, Spain, Sweden, Switzerland, and UK.

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Australia

Year	Period[1]	Consumer Price Index[2] (1980/1981 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia[4] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[5] (June 1985=100)
1980	Avg.	95.8	83.1	—	69.6
1981	Avg.	105.0	85.9	—	76.1
1982	Avg.	116.7	89.0	—	86.4
1983	Avg.	128.5	96.9	—	89.9
1984	Avg.	133.6	98.0	—	96.0
1985	Avg.	142.6	107.3	—	100.0
1986	Avg.	155.5	101.5	—	104.9
1987	Avg.	168.7	108.9	465.88	112.9
1988	Avg.	180.9	111.8	496.90	115.4
1989	Avg.	194.6	117.0	534.65	126.0
1990	Avg.	208.7	123.4	571.43	129.6
Jan	1990	—	119.2	—	128.3
Feb	1990	—	120.8	555.80	128.3
Mar	1990	204.1	121.5	—	128.7
Apr	1990	—	119.9	—	129.0
May	1990	—	118.9	566.60	129.2
June	1990	207.4	116.6	—	129.8
July	1990	—	116.4	—	129.9
Aug	1990	—	122.4	574.10	130.0
Sept	1990	208.9	128.2	—	130.2
Oct	1990	—	134.1	—	130.4
Nov	1990	—	133.7	589.20	130.4
Dec	1990	214.5	128.8	—	130.6
Jan	1991	—	125.6	—	130.6
Feb	1991	—	121.5	597.70	130.6
Mar	1991	214.1	119.1	—	130.8
Apr	1991	—	117.6	—	131.0
May	1991	—	117.8	592.00	131.0
June	1991	214.4	120.4	—	131.0
July	1991	—	120.4	—	131.0R
Aug	1991	—	—	—	131.2

P = Preliminary **R** = Revised since last month

[1] Monthly data for the period 1967 to 1990 appears in Report 278.
[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1980 to June 1981 = 100.0). Figures shown at end of quarter represent quarterly average.
[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0).
[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (Catalogue No. 6312.0). Figures for the latest fourteen months shown are subject to revision.
[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (Catalogue No. 6302.0).

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Canada

				Wage-earner Data: Average Hourly Earnings (C$)[4]				
		Industrial Products Price Index: All Commodities[1] (1986 = 100)[2]	Consumer Price Index: All Items (1986 = 100)[3]	Uranium Mines (SIC 057)	Metal Mines (SIC 051-059)	Mines, Quarries and Oil Wells (SIC 051-099)	Metal Rolling, Casting and Extruding (SIC 298)	Chemicals and Chemical Products Industries (SIC 372-379)
1980	Avg.	75.9	67.2	-.-	-.-	-.-	-.-	-.-
1981	Avg.	83.6	75.5	-.-	-.-	-.-	-.-	-.-
1982	Avg.	89.0	83.7	-.-	-.-	-.-	-.-	-.-
1983	Avg.	92.1	88.5	17.22	14.86	14.18	10.67	11.09
1984	Avg.	96.3	92.4	17.89	15.85	14.97	11.11	11.68
1985	Avg.	99.0	96.0	18.53	16.47	15.56	11.85	12.12
1986	Avg.	100.0	100.0	19.38	16.70	15.76	12.28	12.58
1987	Avg.	102.8	104.4	20.12	17.15	16.11	12.58	13.20
1988	Avg.	107.2	108.6	20.91	18.51	16.95	13.17	13.77
1989	Avg.	109.4	114.0	21.97	20.02	18.41	13.71	14.16
1990	Avg.	109.7	119.4	22.90	20.93	19.12	14.62	15.28
Jan	1990	108.7	116.9	21.88	20.39	19.03	13.99	14.78
Feb	1990	109.5	117.6	22.51	20.63	19.14	14.49	15.03
Mar	1990	109.3	118.0	22.52	20.75	19.17	14.99	15.07
Apr	1990	109.1	118.1	23.17	21.20	19.46	14.83	14.93
May	1990	109.6	118.7	23.28	20.55	19.01	14.71	15.06
June	1990	109.4	119.2	21.85	20.63	18.96	14.69	15.05
July	1990	109.1	119.8	20.92	20.18	18.66	14.34	15.20
Aug	1990	109.3	119.8	23.88	20.51	18.59	14.50	15.33
Sept	1990	110.2	120.2	24.41	21.19	18.94	14.48	15.63
Oct	1990	110.6	121.2	23.11	21.39	19.12	14.78	15.59
Nov	1990	110.9	121.9	23.38	21.83	19.48	14.93	15.73
Dec	1990	111.0	121.8	23.90	21.89	19.88	14.7	16.01
Jan	1991	111.1	125.0	23.79	21.79	19.78	14.66	15.89
Feb	1991	110.6	125.0	25.23	22.45	20.13	14.63	16.10
Mar	1991	109.8	125.5	24.19	22.22	20.27	15.21	16.47
Apr	1991	109.1	125.5	24.77	22.50	20.31	14.63	16.64
May	1991	108.6	126.1	24.38	22.17	20.25	15.05	16.55
June	1991	108.5	126.7	23.58	22.13	19.90	14.65	16.51
July	1991	108.2	126.8	24.70	22.33	19.93	14.56	16.36
Aug	1991	107.8	126.9	24.16 **P**	22.08 **P**	20.08 **P**	14.66 **P**	16.52 **P**
Sept	1991	107.6	126.7	-.-	-.-	-.-	-.-	-.-

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1990 is found in Report 278.

[2] New Base Year of 1986 as of Report 266. Previous Base Year was 1981.

[3] New Base Year of 1986 as of Report 264. Previous Base Year was 1981.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1990 is found in Report 278.

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GOVERNMENT STATISTICS

South Africa

		Average Declared Working Costs per Metric Ton of Gold Ore Milled[1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled[2] (March 1982 = 100)	Consumer Price Index[3] (1990 = 100)	Production Price Index All Groups[4] (1985 = 100)	Total Employment in Mining and Quarrying[5]	Total Salaries and Wages in Mining and Quarrying[5] (1,000 Rand)
							Annual Total[6]
1980	Avg.	35.50	—	25.5 **R**	55.2	709,042	2,237,689
1981	Avg.	41.87	—	29.4 **R**	62.7	722,918	2,756,928
1982	Avg.	47.23	103.9	33.7 **R**	71.4	702,041	3,181,584
1983	Avg.	51.88	115.0	37.8 **R**	79.0	700,901	3,563,282
1984	Avg.	58.95	130.3	42.2 **R**	85.6	711,511	4,134,390
1985	Avg.	68.70	151.7	49.1 **R**	100.0	724,587	4,778,612
1986	Avg.	80.18	177.9	58.2 **R**	119.6	756,637	5,767,950
1987	Avg.	95.01	223.1	67.6 **R**	136.2	751,864	6,911,395
1988	Avg.	106.69	241.1	76.2 **R**	154.1	705,355	7,774,054
1989	Avg.	116.65	273.0	87.4 **R**	177.5	700,360	8,833,934
1990	Avg.	129.37	305.3	100.0 **R**	198.9	677,742	10,193,209
							Monthly Total
Jan	1990	—	—	94.2 **R**	188.9	688,837	801,616
Feb	1990	—	—	94.8 **R**	190.3	674,026	767,274
Mar	1990	126.74	296.3	96.4 **R**	190.8	704,660	780,614
Apr	1990	—	—	97.3 **R**	194.1	696,107	810,474
May	1990	—	—	98.3 **R**	196.6	613,527	719,191
June	1990	128.25	299.87	99.0 **R**	197.2	676,621	841,165
July	1990	—	—	99.7 **R**	197.3	697,242	913,177
Aug	1990	—	—	101.3 **R**	199.4	686,385	902,392
Sept	1990	129.46	312.55	102.9 **R**	202.2	689,317	922,454
Oct	1990	—	—	103.6 **R**	205.5	676,833	882,603
Nov	1990	—	—	105.8 **R**	212.7	669,198	909,418
Dec	1990	133.02	312.37	106.5 **R**	212.0	660,151	942,831
Jan	1991	—	—	107.7 **R**	216.1	648,944	935,839
Feb	1991	—	—	109.0 **R**	216.9	650,948	893,373
Mar	1991	137.66	323.82	110.0 **R**	215.3	651,843	924,930
Apr	1991	—	—	111.5 **R**	216.5	639,939	887,722
May	1991	—	—	113.2 **R**	218.4	630,481	887,107
June	1991	134.65	317.23	114.0 **R**	219.3	—	—
July	1991	—	—	115.5 **R**	221.2	—	—
Aug	1991	—	—	117.1	222.8	—	—
Sept	1991	137.11	329.05	118.7	—	—	—

P = Preliminary **R** = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in Report 278.

[2] Page 16 of Report 178 contains description and calculation of index.

[3] Central Statistical Service, Pretoria: All income groups-weighted average, Historical Data by month appears in Report 278.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in Report 236.

[6] Annual total is shown, rather than monthly average, for indicated year.

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United States

		Producer Price Index [1]		Consumer Price Index [2] (1982-1984 = 100)	GNP Implicit Price Deflator [3] (1982 = 100)	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$) [4]			
		Industrial Commodities (1982 = 100)	All Commodities (1982 = 100)			Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
1980	Avg.	88.0	89.8	82.4	85.7	10.26	10.63	8.31	6.94
1981	Avg.	97.4	98.0	90.9	94.0	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	100.0	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	103.9	12.58	13.43	10.58	8.66
1984	Avg.	103.3	103.7	103.9	107.7	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	110.9	13.38	13.74	11.57	9.46
1986	Avg.	100.0	100.2	109.6	113.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	117.7	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	121.3	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	126.3	13.59	13.72	13.09	10.05
1990	Avg.	115.8	116.3	130.7	131.5	14.10	14.36	13.54	10.32
Jan	1990	114.1	114.9	127.4	—	13.69	13.95	13.34	10.13
Feb	1990	113.6	114.4	128.0	—	13.70	13.99	13.27	10.16
Mar	1990	113.2	114.2	128.7	129.5	13.80	14.04	13.34	10.17
Apr	1990	113.2	114.1	128.9	—	13.92	14.30	13.53	10.17
May	1990	113.5	114.6	129.2	—	13.96	14.16	13.46	10.22
June	1990	113.2	114.3	129.9	131.0	14.00	14.31	13.51	10.27
July	1990	113.4	114.5	130.4	—	14.29	14.49	13.58	10.34
Aug	1990	115.9	116.5	131.6	—	14.27	14.60	13.57	10.33
Sept	1990	118.4	118.4	132.7	132.2	14.41	14.48	13.62	10.42
Oct	1990	121.4	120.8	133.5	—	14.43	14.58	13.72	10.47
Nov	1990	120.7	120.1	133.8	—	14.34	14.73	13.73	10.53
Dec	1990	119.0	118.7	133.8	133.1	14.39	14.69	13.75	10.57
Jan	1991	119.3	119.0	134.6	—	14.73	14.63	13.85	10.60
Feb	1991	117.2	117.2	134.8	—	14.80	14.55	13.81	10.59
Mar	1991	115.6	116.1	135.0	134.8	14.93	14.55	13.85	10.55
Apr	1991	115.6	116.0	135.2	—	14.85	14.56	13.96	10.63
May	1991	116.1	116.5	135.6	—	14.79	14.52	14.01	10.66
June	1991	116.0	116.3	136.0	136.1	14.88	14.51	14.05	10.74
July	1991	116.0	116.0	136.2	—	15.09 **R**	14.56 **R**	14.16 **R**	10.77
Aug	1991	116.4	116.2	136.6	—	14.84 **P**	14.62 **P**	14.04 **R**	10.78
Sept	1991	116.2	116.0	137.2	136.9	—.—	—.—	14.14 **P**	10.81 **P**

P = Preliminary **R** = Revised since last month

[1] US Bureau of Labor Statistics, Washington, DC: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents. Historical data is presented in Report 278.

[2] US Bureau of Labor Statistics, Washington, DC: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in Report 278.

[3] US Department of Commerce, Washington, DC: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted. Historical data is presented in Report 278.

[4] US Bureau of Labor Statistics, Washington, DC: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in Report 278.

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GOVERNMENT STATISTICS

Volume and Price of Uranium Deliveries To The European Community[1]

— Compiled from data published by the Euratom Supply Agency —

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price in ECU per pound U_3O_8	Medium or Long-Term Contracts[3] Average Price in US Dollars per pound U_3O_8	Spot Contracts[3] Average Price in ECU per pound U_3O_8	Spot Contracts[3] Average Price in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19
1990	12,800	16.7	ECU 23.08	$29.39	ECU 7.60	$ 9.68

P = Preliminary **R** = Revised since last month

[1] The twelve European Community member nations are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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US Uranium Marketing Activities Statistics

— Compiled from data published by the US Energy Information Administration [1] —

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers[2] (million pounds U_3O_8)	Average Price of Delivered Uranium[2] (\$/lb. U_3O_8)	Quantity of Uranium Imported[3] (million pounds U_3O_8)	Average Price of Imported Uranium (\$/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	$16.10	3.6	n/a	1.2
1977	29.9	27.8	$19.75	5.6	n/a	4.0
1978	37.0	31.6	$21.60	5.2	n/a	6.8
1979	37.5	33.0	$23.85	3.0	n/a	6.2
1980	43.7	35.0	$28.15	3.6	$43.10	5.8
1981	38.5	32.6	$34.65	6.6	$32.90	4.4
1982	26.9	23.5	$38.37	17.1	$25.19	6.2
1983	21.2	24.2	$38.21	8.2	$26.16	3.3
1984	14.9	22.5	$32.65	12.5	$21.86	2.2
1985	11.3	21.7	$31.43	11.7	$20.08	5.3
1986	13.5	18.9	$30.01	13.5	$20.07	1.6
1987	13.0	20.8	$27.37	15.1	$19.14	1.0
1988	13.1	17.6	$26.15	15.8	$19.03	3.3
1989	13.8	18.4	$19.56	13.1	$16.75	2.1
1990	8.9	20.5	$15.70	23.7	$12.55	2.0

P = Preliminary   R = Revised since last month

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity.*
1984-1990: Energy Information Administration, *Uranium Industry Annual.*

[2] Data for 1976-1981 includes both domestic utilities and agents.

[3] Includes imports by domestic utilities and domestic suppliers.

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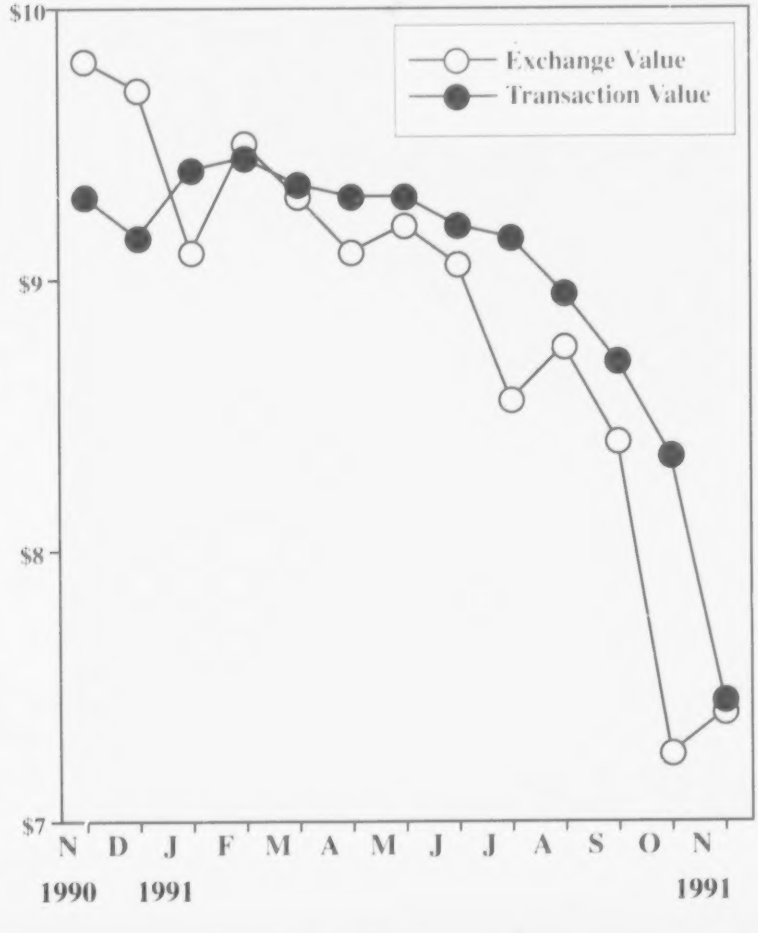

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While most market participants expected prices to remain depressed in 1991, nearly all were surprised or dismayed that U_3O_8 prices dropped to almost $7 per pound. Uranium market volume was considerable in 1991, thus far totalling 26.6 million pounds equivalent U_3O_8, but significantly lagging 1990's record volume. The conversion and loan markets remained comparatively stable, but enrichment sales rose significantly, as did the SWU Value during 1991.

- **World Uranium Enrichment Requirements to 2005** 23

Total projected enrichment requirements to 2005 equal 38.6 million SWU. Despite the fact that the enrichment market already is characterized by production overcapacity, additional capacity is still planned for operation by the late 1990s. Consequently, supply will remain abundant and production costs will become an increasingly important factor in a competitive market.

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MARKET REVIEW

Market Values Summary

NUEXCO Market Values	This Report November 30, 1991	Last Report October 31, 1991	12 Months Ago November 30, 1990
EXCHANGE VALUE [1]	**$7.40** / lb equivalent U_3O_8	$7.25	$9.80
UF_6 VALUE [2]	**$22.75** / kg U as UF_6	$22.75	$28.75
LOAN RATE [3]	**3.5%** / annum	3.5%	3.5%
CONVERSION VALUE [4]	**$1.55** / lb U as UF_6	$1.55	$1.45
SWU VALUE [5] (0.3 w/o tails assay)	**$68** / SWU	$68	$51
TRANSACTION VALUE [6]	**$7.45** / lb equivalent U_3O_8	$8.35	$9.30
Transactions	**22**	22	16
Months	**3**	3	3
Millions of Pounds	**4.9**	4.6	3.0

DEFINITIONS

[1] The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

[2] The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

[3] The **Loan Rate** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

[4] The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

[5] The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

[6] The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

a) Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;
b) At least ten transactions;
c) Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.
- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.
- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight-percent U^{235} and a product assay of 3.0 weight-percent U^{235}, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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NOVEMBER MARKET REVIEW

(as of November 30, 1991)

OVERVIEW

After falling to new lows in early November, market prices firmed late in the month with the Exchange Value rising slightly to $7.40 per pound U_3O_8. Low prices brought several discretionary buyers into the market, which stalled the market decline, at least temporarily. Competition among suppliers for limited UF_6 demand kept prices level; the UF_6 Value was unchanged at $22.75 per kgU as UF_6. Twelve near-term concentrates sales totalling almost three million pounds equivalent U_3O_8 were reported, but no near-term natural UF_6 transactions were reported. Six long-term natural uranium sales were reported, totalling over 2.4 million lbs equivalent U_3O_8, four of these sales occurred earlier in 1991.

November's transactions bring total year-to-date market volume up to 26.6 million pounds equivalent U_3O_8 in 103 transactions (**Table 1**). This total includes transactions previously not reported that occurred earlier in the year. While the number of transactions approaches 1990's level at this time (108), market volume for 1991 lags last year's record volume by over 12.9 million pounds.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	November 1991		Year-to-Date	
	No. of Sales	Volume[1]	No. of Sales	Volume[1]
Concentrates	12	3.0	73	18.0
Natural UF_6	0	0.0	18	4.9
EUP	1	0.3	12	3.8
Total[2]	**13**	**3.2**	**103**	**26.6**

[1] Million pounds equivalent U_3O_8
[2] Due to independent rounding, columns may not equal total.

A preliminary review and analysis of the uranium market in 1991 is included in this Report beginning on page 16.

The Loan Rate remained unchanged at 3.5 percent per annum, as did the Conversion Value, which remained $1.55 per lb U as UF_6. No loans or conversion transactions were reported.

The SWU Value also was unchanged at $68 per SWU. Two near-term SWU sales totalling almost 200 thousand SWU were reported. Three long-term SWU transactions also were reported, with delivery of over 2.1 million SWU scheduled during the period 1994-2001.

URANIUM AND CONVERSION

After reaching new lows early in the month, uranium market prices firmed as several discretionary buyers entered the market, thus halting further price declines. The **Exchange Value** climbed to **$7.40** per pound U_3O_8 on November 30—a $0.15 increase from its October 31 level. Numerous sellers still were competing for sales at the end of November, albeit less aggressively than earlier in the month.

As the month came to a close, both buyers and sellers were uncertain which direction the market was headed in the near-term. As a result, transactions were concluded both above and below the November 30 Exchange Value, as the numerous market participants reacted differently to factors such as timing, origin, delivery location, and the potential effects of the recently filed anti-dumping petition against the Soviet Union. The range of prices was fairly narrow, as eleven of November's twelve concentrates sales took place within five percent of the November 30 Exchange Value. Furthermore, this range narrowed considerably during the latter half of the month.

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Although this range narrowed, uncertainty still exists in the marketplace. However, the uncertainty has not been great enough to cause buyers and sellers to leave the market. Buyers may be hesitant, but with prices near record lows, they may feel it is better to purchase now, than to risk potential price increases in the future. Sellers are equally uncertain, but may feel it is better to sell now than to wait and find that prices have once again declined. Thus, most participants are not withdrawing from the market, and the result is an active, but cautious, marketplace. The twelve near-term concentrates transactions reported from November total almost 3.0 million pounds equivalent U_3O_8 for delivery within the next six months. Intermediaries sold to six producers and six utilities, with most of the transactions involving US entities.

* * *

The **UF_6 Value** was unchanged at **$22.75** per kgU as UF_6. Unlike past months, when the UF_6 market mirrored the concentrates market, competition among suppliers for the limited UF_6 demand kept prices level. No near-term natural UF_6 transactions were concluded, although two sales of enriched UF_6 were reported. These EUP sales totalled over 800 thousand pounds equivalent U_3O_8, although one of the sales occurred earlier in 1991.

Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply[1]	Active Demand[1]
• Uranium (thousand lbs equivalent U_3O_8)	5,030	2,925
• Supply/Demand Ratio:	1.7	
• Loan (thousand lbs equivalent U_3O_8)	6,020	0
• Conversion (thousand lbs U as UF_6)	880	1,500
• SWU (thousand SWUs)	400	0

[1] Supply and Demand tables in the Market Review section of this Report provide details for each category.

In the long-term market, two sales were reported, one involving concentrates, the other natural UF_6. These sales by European intermediaries totalled over 300 thousand pounds equivalent U_3O_8 for delivery in 1993. In addition, four long-term concentrates sales that occurred earlier this year were reported: Australian and Canadian producers sold over 2.1 million pounds U_3O_8 for 1992-1996 delivery.

* * *

The **Transaction Value** fell $0.90, to **$7.45** per pound U_3O_8 based on 22 transactions over 3 months involving 4.9 million pounds equivalent U_3O_8. November's high volume of low-priced sales brought the Transaction Value down to a record low. The Transaction Value previously had never dropped below $8 per pound since its first publication on May 31, 1976.

* * *

As would be expected with record low price levels, **active uranium demand** showed a net increase at month end of 1.3 million pounds, having risen to **2.9** million pounds equivalent U_3O_8. Active demand during much of November was considerably higher, but many buyers concluded purchases near the end of the month, thus lowering the final total.

Active uranium supply decreased by 2.3 million pounds, to **5.0** million pounds equivalent U_3O_8. Despite the climb in demand, ample supply was still available to meet buyers' needs, and the **supply/demand ratio** only declined to **1.7**.

* * *

Despite continued downward pressure, the **Loan Rate** remained at **3.5** percent per annum. No loans were reported from November. Loan demand remains at zero (**Table 2**) for the seventh consecutive month.

* * *

The **Conversion Value** remained at **$1.55** per pound U as UF_6. No conversion transactions were reported.

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as the spot conversion market has been quiet for the past few months. The lack of UF_6 demand has contributed to the calm, as most recent purchases involved concentrates, which were converted under long-term contracts.

ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

The **SWU Value** was unchanged at **$68** per SWU. Compared to mid-1991, the enrichment market has quieted. Little new demand has emerged recently and activity is not expected to increase until after the first of the year. Only two near-term sales involving SWU contained in EUP were reported: the sales totalled less than 200 thousand SWU, with one of the sales occurring earlier in 1991. Three long-term enrichment transactions were reported in which utilities purchased a total exceeding 2.1 million SWU for delivery during 1994 through 2001. Only two buyers were evaluating near- and long-term SWU offers at month end.

Table 3
ENRICHMENT PRICES
(November 30, 1991)

Prices	This Month Report 280	Last Month Report 279	12 Months Ago Report 268
NUEXCO SWU Value ($US per SWU)	68	68	51
US DOE SWU prices: ($US per SWU)			
USEC	121.50[1]	121.50[1]	117.85[2]
AFC	153.00[3]	153.00[3]	153.00[3]
Requirements	157.00[3]	157.00[3]	157.00[3]
Incentive Price (IP2)	104.67[4]	104.67[4]	100.68[5]
Calculated worth of enriched UF_6[6]**:** ($US per KgU as UF_6)			
2.0 $^{w}/_{o}$ U^{235}	209	208	206
2.5 $^{w}/_{o}$ U^{235}	295	292	284
3.0 $^{w}/_{o}$ U^{235}	382	380	364
3.5 $^{w}/_{o}$ U^{235}	472	469	446
4.0 $^{w}/_{o}$ U^{235}	564	560	528
4.5 $^{w}/_{o}$ U^{235}	656	652	612

[1] Effective 10/1/91.
[2] Effective 10/1/89 to 9/30/91.
[3] Effective since 10/1/84.
[4] Provisional IP2 for FY92: Effective 10/1/91 to 9/30/92, for up to 30% of annual requirements.
[5] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.
[6] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 $^{w}/_{o}$ U^{235} tails assay.

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RECENT TRANSACTIONS

Uranium Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5278A	1992	101-300	See Remarks	Intermediary	Intermediary	Contained in EUP
5280	1991	301-600	90-97	Utility	Intermediary	
5281	1992	50-100	90-97	Utility	Intermediary	
5285A	1991	600-1,000	See Remarks	Utility	Utility	Contained in EUP–Occurred earlier in 1991
5286	1992	301-600	90-97	Producer	Intermediary	
5287	1992-1996	601-1,000	See Remarks	Utility	Producer	Occurred earlier in 1991.
5288	1992-1996	301-600	See Remarks	Utility	Producer	Occurred earlier in 1991.
5289	1992-1996	601-1,000	See Remarks	Utility	Producer	Occurred earlier in 1991.
5290	1992-1996	301-600	See Remarks	Utility	Producer	Occurred earlier in 1991.
5291	1993	101-300	Above 110	Utility	Intermediary	UF_6
5292	1992	50-100	98-102	Producer	Intermediary	
5293	1992	101-300	90-97	Utility	Intermediary	
5297	1993	101-300	Above 110	Producer	Intermediary	
5298	1991	101-300	90-97	Producer	Intermediary	
5299	1991	101-300	103-110	Producer	Intermediary	
5300	1992	101-300	103-110	Utility	Intermediary	
5301	1991	301-600	90-97	Producer	Intermediary	
5302	1991	101-300	90-97	Utility	Intermediary	
5303	1992	50-100	103-110	Producer	Intermediary	
5304	1992	301-600	90-97	Utility	Intermediary	

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Exchange Value or UF_6 Value. The endpoints of each range are included within that range.

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RECENT TRANSACTIONS

Natural Uranium Loans [1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Loan Rate	Borrower	Lender	Remarks
No loans of natural uranium are reported						

Conversion Sales [1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range[2] of Current Conversion Value	Buyer	Seller	Remarks
No sales of conversion are reported						

Enrichment Sales [1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity[3] (thousand SWU)	Price Within Percentage Range[2] of Current SWU Value[4]	Buyer	Seller	Remarks
5278B	1992	50-100	See Remarks	Intermediary	Intermediary	Contained in EUP
5285B	1991	101-300	See Remarks	Utility	Utility	Contained in EUP–Occurred earlier in 1991.
5294	1996-2000	1,001-3,000	**R**	Utility	**R**	
5295	1994	50-100	See Remarks	Utility	Intermediary	Base Escalated
5296	1996-2001	301-600	See Remarks	Utility	Intermediary	Series of Fixed Prices

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110,* represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., X dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

Uranium Supply

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term [1]	Quantity (Thousand Pounds equivalent U_3O_8) Intermediate or Long-term [2]	Delivery Period	Remarks
AVAILABLE TO PURCHASE:				
ACTIVE				
90-1307	330	—	1991	
91-1502	500	—	1991	
91-1505	1,000	—	1991	
91-1506	500	—	1991	
91-1507	500	—	1991	
91-1511	260	—	1991	UF_6
91-1512	785	—	1991	UF_6
91-1503A	500	3,500	1991-1993	UF_{6e}
91-1241	655	650 per year	1992-1996	
91-1268*	—	1,000 per year	1992-2001	
TOTAL	**5,030**			
INACTIVE	**4,430**			
AVAILABLE TO LOAN:				
ACTIVE				
90-1057A*	310	—	—	UF_6
91-1084	3,900	—	—	U_3O_8
91-1174	1,000	—	—	U_3O_8
91-1219	260	—	—	U_3O_8
91-1220	325	—	—	UF_6
91-1260*	225	—	—	U_3O_8/UF_6
TOTAL	**6,020**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 90-1227
Active Projects removed since last month: 91-1215, 91-1513

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SUPPLY AND DEMAND

Uranium Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term [1]	Intermediate or Long-term [2]	Delivery Period	Remarks
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1234	25	—	1992	U_3O_8/UF_6
91-1235*	300	—	1991-1992	U_3O_8/UF_6
91-1263*	130	—	1991	U_3O_8/UF_6
91-1271*	1,570	—	1992	UF_6
91-1272*	250	—	1991	
91-1277*	650	—	1991-1992	
91-1118	—	300 per year	1993-1998	U_3O_8/UF_6
91-1184	—	350 per year	1993-1997	
91-1259*	—	200 per year	1995-1997	
91-1197	—	2,210	1992-1997	U_3O_8/UF_6
91-1227A	—	60	1992-1994	UF_6e
91-1245	—	1,000	1993-1997	
91-1255	—	2,250	1993-1996	
TOTAL	**2,925**			
INACTIVE	**1,350**			

INQUIRIES TO BORROW: *No inquiries to borrow are reported*

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 91-1258
Active Projects removed since last month: 90-1304, 91-1246, 91-1249, 91-1256, 91-1257

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SUPPLY AND DEMAND

Conversion Supply and Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF6) Within 3 Years[1]	Beyond 3 Years[1]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1500	440	—	1991	
91-1501	440	—	1991	
TOTAL	**880**			
INACTIVE	*None reported*			
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1264*	880	—	1992-1993	
91-1275*	620	—	1992	
TOTAL	**1,500**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: *none*

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SUPPLY AND DEMAND

SWU Supply And Demand

NUEXCO Project Number	Quantity (Thousand SWUs) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
90-1078D	200	—	1991	UF_6e
91-1509	200	—	1992	
TOTAL	**400**			
INACTIVE	**935**			
INQUIRIES TO PURCHASE:				
ACTIVE				
90-1196	—	60 per year	1995 on	
91-1142	—	75 per year	1995-2000	
91-1066	—	320	1995-2000	
91-1152	—	2,700	1995-2001	
91-1171	—	560	1995-1998	
91-1227B	—	35	1992-1994	UF_6e
91-1232	—	400	1993-1994	
91-1250	—	45	1993	UF_6e
TOTAL	**0**			
INACTIVE	**265**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: 91-1027, 91-1094B, 91-1187, 91-1199

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MARKET REVIEW

MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Exchange Value[1]

Country (currency)	per lb equivalent U3O8 as Concentrates This Month (Nov 30, 1991)	Last Month (Oct 31, 1991)	12 Months Ago (Nov 30, 1990)	per kg U as Concentrates This Month (Nov 30, 1991)	Last Month (Oct 31, 1991)	12 Months Ago (Nov 30, 1990)
Australia (dollar)	9.43	9.21	12.70	24.52	23.93	33.02
Belgium (franc)	247.33	249.40	304.73	642.99	648.38	792.22
Canada (dollar)	8.40	8.15	11.41	21.83	21.18	29.66
EC (ecu)	5.92	5.94	7.11	15.40	15.43	18.48
Finland (markka)	32.49	29.58	35.32	84.46	76.90	91.82
France (franc)	41.03	41.43	49.81	106.67	107.72	129.49
Germany (mark)	12.02	12.13	14.76	31.26	31.52	38.38
Italy (lira)	9,052	9,084	11,088	23,533	23,617	28,828
Japan (yen)	960.91	948.33	1,307	2,498	2,465	3,399
Netherlands (guilder)	13.55	13.66	16.66	35.23	35.50	43.30
So. Africa (comm. rand)	20.72	20.54	24.55	53.87	53.39	63.82
So. Korea (won)	5,579	5,438	7,002	14,505	14,137	18,204
Spain (peseta)	764.78	762.68	935.92	1,988	1,983	2,433
Sweden (krona)	44.02	44.51	83.40	114.45	115.71	216.83
Switzerland (franc)	10.61	10.65	12.57	27.59	27.68	32.69
Taiwan (dollar)	190.62	188.50	262.09	495.58	490.05	681.37
UK (pound)	4.19	4.17	5.06	10.88	10.84	13.15
US (dollar)	7.40	7.25	9.80	19.24	18.85	25.48

Transaction Value[1]

Country (currency)	per lb equivalent U3O8 as Concentrates This Month (Nov 30, 1991)	Last Month (Oct 31, 1991)	12 Months Ago (Nov 30, 1990)	per kg U as Concentrates This Month (Nov 30, 1991)	Last Month (Oct 31, 1991)	12 Months Ago (Nov 30, 1990)
Australia (dollar)	9.50	10.60	12.05	24.69	27.57	31.34
Belgium (franc)	249.00	287.24	289.18	647.34	746.75	751.80
Canada (dollar)	8.45	9.38	10.83	21.98	24.39	28.14
EC (ecu)	5.96	6.84	6.74	15.50	17.78	17.53
Finland (markka)	32.71	34.07	33.52	85.03	88.57	87.14
France (franc)	41.31	47.72	47.27	107.39	124.06	122.89
Germany (mark)	12.11	13.97	14.01	31.47	36.31	36.42
Italy (lira)	9,113	10,462	10,523	23,692	27,200	27,357
Japan (yen)	967.41	1,092	1,241	2,515	2,840	3,225
Netherlands (guilder)	13.64	15.73	15.81	35.47	40.89	41.09
So. Africa (comm. rand)	20.86	23.65	23.30	54.24	61.50	60.57
So. Korea (won)	5,617	6,263	6,645	14,603	16,282	17,275
Spain (peseta)	769.95	878.39	888.17	2,002	2,284	2,309
Sweden (krona)	44.32	51.26	79.15	115.22	133.26	205.77
Switzerland (franc)	10.68	12.26	11.93	27.77	31.88	31.02
Taiwan (dollar)	191.91	217.10	248.72	498.93	564.41	646.61
UK (pound)	4.21	4.80	4.80	10.96	12.48	12.48
US (dollar)	7.45	8.35	9.30	19.37	21.71	24.18

[1] As of May 1991 Report #273; calculated using currency exchange rates **for** the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273; calculated using currency exchange rates published in *The Wall Street Journal* **on** the last business day of the month.

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Conversion Value[1]

Country (currency)	per lb U as UF6 This Month (Nov 30, 1991)	per lb U as UF6 Last Month (Oct 31, 1991)	per lb U as UF6 12 Months Ago (Nov 30, 1990)	per kg U as UF6 This Month (Nov 30, 1991)	per kg U as UF6 Last Month (Oct 31, 1991)	per kg U as UF6 12 Months Ago (Nov 30, 1990)
Australia (dollar)	1.98	1.97	1.88	4.36	4.34	4.14
Belgium (franc)	51.80	53.32	45.09	114.21	117.55	99.40
Canada (dollar)	1.76	1.74	1.69	3.88	3.84	3.72
EC (ecu)	1.24	1.27	1.05	2.73	2.80	2.32
Finland (markka)	6.80	6.32	5.23	15.00	13.94	11.52
France (franc)	8.59	8.86	7.37	18.95	19.53	16.25
Germany (mark)	2.52	2.59	2.18	5.55	5.72	4.82
Italy (lira)	1,896	1,942	1,641	4,180	4,282	3,617
Japan (yen)	201.27	202.75	193.44	443.73	446.98	426.45
Netherlands (guilder)	2.84	2.92	2.46	6.26	6.44	5.43
So. Africa (comm. rand)	4.34	4.39	3.63	9.57	9.68	8.01
So. Korea (won)	1,169	1,163	1,036	2,576	2,563	2,284
Spain (peseta)	160.19	163.05	138.48	353.16	359.47	305.29
Sweden (krona)	9.22	9.52	12.34	20.33	20.98	27.21
Switzerland (franc)	2.22	2.28	1.86	4.90	5.02	4.10
Taiwan (dollar)	39.93	40.30	38.78	88.03	88.85	85.49
UK (pound)	0.88	0.89	0.75	1.93	1.97	1.65
US (dollar)	1.55	1.55	1.45	3.42	3.42	3.20

SWU Value And UF6 Value[1]

Country (currency)	SWU Value at 0.30 w/o Tails Assay This Month (Nov 30, 1991)	SWU Value at 0.30 w/o Tails Assay Last Month (Oct 31, 1991)	SWU Value at 0.30 w/o Tails Assay 12 Months Ago (Nov 30, 1990)	UF6 Value per kg U as UF6 This Month (Nov 30, 1991)	UF6 Value per kg U as UF6 Last Month (Oct 31, 1991)	UF6 Value per kg U as UF6 12 Months Ago (Nov 30, 1990)
Australia (dollar)	86.68	86.35	66.10	29.00	28.89	37.27
Belgium (franc)	2,273	2,339	1,586	760.36	782.59	893.97
Canada (dollar)	77.16	76.40	59.36	25.81	25.56	33.47
EC (ecu)	54.52	55.68	36.99	18.21	18.63	20.85
Finland (markka)	298.52	277.44	183.80	99.87	92.82	103.61
France (franc)	377.02	388.62	259.21	126.14	130.01	146.12
Germany (mark)	110.50	113.73	76.83	36.97	38.05	43.31
Italy (lira)	83,180	85,202	57,705	27,829	28,505	32,530
Japan (yen)	8,830	8,895	6,804	2,954	2,976	3,835
Netherlands (guilder)	124.52	128.08	86.68	41.66	42.85	48.86
So. Africa (comm. rand)	190.42	192.63	127.76	63.71	64.45	72.02
So. Korea (won)	51,270	51,001	36,439	17,153	17,063	20,542
Spain (peseta)	7,028	7,153	4,871	2,351	2,393	2,746
Sweden (krona)	404.52	417.43	434.04	135.34	139.66	244.68
Switzerland (franc)	97.51	99.85	65.43	32.62	33.41	36.89
Taiwan (dollar)	1,752	1,768	1,364	586.04	591.49	768.88
UK (pound)	38.47	39.10	28.32	12.87	13.08	14.84
US (dollar)	68.00	68.00	51.00	22.75	22.75	28.75

[1] As of May 1991 Report #273; calculated using currency exchange rates **for** the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273; calculated using currency exchange rates published in *The Wall Street Journal* **on** the last business day of the month.

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RECENT DEVELOPMENTS

USA

International Trade Commission Public Conference

The staff of the International Trade Commission (ITC) held a public conference on December 3, 1991, to investigate the antidumping petition against imports of Soviet uranium filed by the Oil, Chemical and Atomic Workers International Union (OCAW) and a subgroup of the Uranium Producers of America. ITC procedure allowed the petitioners and the opposition each an hour to state their case. The purpose of the ITC investigation is to determine if injury to the domestic uranium industry has been caused by the Soviet imports. At the conference, only ITC staff were present to hear the testimony; they were allowed to interrupt with questions, but there was no cross examination. The conference was the only public opportunity to discuss the petition before the ITC. Both parties were then required to submit briefs elaborating their positions within three days after the conference. The ITC staff assembled and analyzed the issues for the Commissioners assigned to the case, who then made a preliminary determination whether to dismiss the petition or continue the investigation.

The petitioners were represented by their counsel, Valerie Slater of Akin, Gump, Hauer & Feld; their economic consulting firm, ICF Associates; their industry analyst, Dan Collier of NAC; Robert Moyer of Pathfinder Mines; Joseph Card of Uranium Resources Inc.; Dean Alexander of the OCAW; Eugene Schmitt of DOE's uranium enrichment office, as well as DOE counsel and independent counsel from Steptoe and Johnson. The petitioners emphasized two points in their presentation. They claimed there is only one uranium industry, encompassing the mining and milling companies, converters, and DOE. This claim was based on their view that the processing of uranium from U_3O_8 to UF_6 to EUP, does not change its fundamental characteristics. The second claim was that the "industry" had been injured as a direct result of Soviet uranium imports.

Testifying in opposition to the petition were NUEXCO, GNSS, and Energy Fuels, represented by Frank Fahrenkopf and Lewis Leibowitz from the legal firm of Hogan & Hartson; the economic consulting firm of Putnam, Hayes and Bartlett, Inc.; and Paula Stern, a former ITC commissioner, now an independent consultant. In refuting the petitioners' claims, Mr. Leibowitz stated that uranium is substantially transformed at different stages in the nuclear fuel cycle, that this material is traded separately, and has different uses. The opposition argued that the US uranium industry could not have been injured by Soviet imports because it is not possible to hurt an industry that has been declared "non-viable" by the US government for the last six years. An additional argument was made that the petitioners' economic consultants analyzed the world market incorrectly when they removed the Soviet uranium from consideration in the world market, as well as in the US market. Even if removed from the US market, the supply of Soviet material will still be available and will continue to impact the world price of uranium. Further, they argued that limiting Soviet imports would not help the US uranium industry because other low cost suppliers from Canada or Australia would meet any available demand. The petitioners themselves have admitted they cannot compete at today's prices, and these prices will not change simply by applying dumping duties to remove the Soviets from the US market. The final point made by those opposing the petition was that DOE has no standing to ally itself with the petitioners: it is a government entity not eligible for relief under US trade statutes. Based upon these arguments, the ITC was asked to dismiss the petition.

On December 18, the ITC commissioners made a preliminary decision that the issues merit further investigation. The procedure is now continued by the International Trade Administration of the Department of Commerce. This entity has 160 days to ascertain if, in fact, the Soviet uranium marketed in the USA was sold at less than fair market value.

INDUSTRY BRIEFS

NRC Approves Rule For Reactor License Extension

On October 15, the Nuclear Regulatory Commission (NRC) unanimously approved new regulations for 20-year license extensions of US nuclear power plants. NRC Chairman, Ivan Selin, stated that the license extension process is "tough", as it requires the operating utility to submit the results of extensive technical analyses in support of its application to operate a reactor 20 years beyond its original 40-year license.

The new regulations do not require utilities to compile and submit documentation for the current licensing basis (CLB) for the plant. The CLB includes all NRC regulations, requirements, rules, and all utility commitments to the NRC over the operating life of the reactor. While the CLB would provide the NRC with useful additional information for considering the safety of the plant's operation in the extension period, it would require the utility to submit several thousand more documents, greatly increasing the cost of the application and the time necessary for review. Inclusion of the CLB in the application also might open a plant's current operation to intervenor actions. The license renewal review process allows for public comment, but only on issues relating to operation of a plant during the 20-year extension period, not on issues concerning its current 40-year license.

Westinghouse, BNFL and ENUSA Form New European Fuel Group

In an effort to optimize their investments in production and marketing, Westinghouse, British Nuclear Fuels Ltd. (BNFL), and Empresa Nacional del Uranio SA (ENUSA) have formed the European Fuel Group (EFG). EFG has no personnel or headquarters, and required no monetary exchange for its formation. It is only a cooperative agreement among the three companies to pool their resources for the marketing, design, and manufacture of PWR fuel for the European market. Each company will separately negotiate contracts, but will assign the work to the appropriate member of EFG.

Westinghouse hopes to make gains in fuel manufacturing and related services after the recent dissolution of its agreement with Asea Brown-Boveri. BNFL hopes to gain in markets for fuels using reprocessed materials, and ENUSA hopes to break into the European market for fuel fabrication.

PRI Sells Interest In Gas Hills Uranium Project To UG Mining

Power Resources Incorporated (PRI) recently sold a 25-percent interest in its Gas Hills in-situ leach uranium project to UG Mining Inc., a US subsidiary of Urangesellschaft of Germany. The two companies then formed a joint venture to develop and manage Gas Hills production. PRI has estimated mineable reserves at the project near Douglas, Wyoming, at about 20 million pounds U_3O_8, and production is planned for 1997.

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France Opens Waste Site

ANDRA, France's national agency for the management of nuclear waste, officially opened its new FF1.2 billion Aube Storage Center for storage of low-level and medium-level wastes. The center has a capacity of one million cubic meters of short- and medium-term nuclear wastes. Plans call for the center to be filled by 2020 and have a design life of 300 years. The Aube Storage Center is intended to succeed the La Manche Storage Center which is already filled to its 0.5 million cubic meter capacity and will be closed and sealed in 1994.

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Sweden To Help Lithuania Create Nuclear Agency

The Swedish Nuclear Power Inspectorate (SKI) will lead efforts to help Lithuania establish a nuclear regulatory agency and initiate an inspection program for its RBMK (graphite- moderated, water-cooled) nuclear power plants. The program will include a probabilistic safety analysis, and a study of systems analysis, core physics, regulatory aspects, safety, and quality assurance.

Lithuania, located not far from Sweden, operates the world's two largest RBMK nuclear power plants, each rated at 1,380-MWe (net).

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Rio Algom Cancels Merger With Uranium Resources

On Wednesday November 27, Rio Algom Mining Corporation ended its merger agreement with Uranium Resources Inc. Rio Algom's primary reason given for terminating the merger was further declines in the uranium market since the agreement was announced in May 1991.

No comment was made on the effects of Canadian tax law on the decision to cancel the merger. During the past few months, possible tax law implications had been stated as the reason the merger had been delayed.

Nuclear Reactor Milestones

During the last few months, nuclear utilities around the world have announced reactor records, anniversaries, or other developments. In August, Scottish Nuclear's Hunterston B2 set a new record of 305 days of continuous operation by an advanced gas-cooled reactor. The past record was just under 273 days.

On October 17, the United Kingdom's Calder Hall 1 marked its thirty-fifth anniversary. Operated by British Nuclear Fuels Ltd., the 50-megawatt-electric (net) Magnox (graphite moderated, gas-cooled) reactor was the world's first nuclear power plant built on an industrial scale. The previous month, Japan Atomic Power Company's Tokai 1 station marked its twenty-fifth anniversary of operation. The design of this plant is based on that of the Calder Hall units.

After 24 years of operation, France permanently shut down the Chooz A 305-MWe (net) prototype pressurized water reactor (PWR) on October 30, due to high operating costs. Chooz A is owned by Société d'Energie Nucléaire Franco-Belge des Ardennes, a consortium formed by Electricité de France and Belgian utilities.

Regarding reactors that are under construction, China has delayed the start-up of Daya Bay 1 to 1993. The previous schedule called for start-up of the 900-MWe (gross) PWR in October 1992. Daya Bay 2 is scheduled to start up six months after Unit 1. The United Kingdom's first PWR, Sizewell B, is still ahead of schedule, having had its pressure vessel recently put in place.

US Nuclear Utilities Pool $50 Million for Advanced LWR Development

The US nuclear industry recently announced that it has secured more than 90 percent of the utilities' commitments toward its $50-million share of funding for development of first-of-a-kind (prototype) engineering in the advanced light water reactor (ALWR) program. Nuclear equipment vendors will contribute another $50 million after the first year of the program. These contributions by the US commercial nuclear power industry match the US Department of Energy's planned five-year infusion of $100 million into the engineering portion of the ALWR development program.

The announcement was made by Sherwood Smith (chairman of the Nuclear Power Oversight Committee, and chief executive officer of Carolina Power & Light Company) at the U.S. Council for Energy Awareness's November 1991 Nuclear Energy Forum, held in San Francisco, California.

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PRELIMINARY 1991 MARKET REVIEW

OVERVIEW

Few market participants would have predicted the events of the uranium market this past year. While most expected prices to remain depressed, nearly all participants were surprised as prices continued to fall below $8 per pound U_3O_8. In fact, as evidenced by a few transactions late this year, prices even dipped briefly below $7 per pound. The fundamental reason for the price decline is straightforward: overly abundant supply chasing limited demand. While specific events may affect the market temporarily, there cannot be a sustained price recovery until supply and demand are more in balance.

Through November 1991, market volume lagged significantly behind last year's record level (**Table 1**). While the number of 1991 transactions concluded through November approaches that of 1990 (103 vs. 108), this year's volume falls short of the 1990 quantity by 12.9 million pounds equivalent U_3O_8. The shortfall can be attributed to lower demand—the result, in large measure, of the record quantities purchased in 1990. A major factor in last year's record sales was a large volume of discretionary purchases by both utilities and producers. This year, as market prices continually dropped below expectations month after month, discretionary buyers became more cautious, each trying to anticipate a market bottom. As a result of this caution, when buyers did make discretionary purchases, the transactions usually involved smaller quantities.

Table 1
NEAR-TERM URANIUM SALES
1990 versus 1991 through November

	1991 through November		**1990 through November**	
Product	**Number of Sales**	**Volume (Million pounds equivalent U_3O_8)**	**Number of Sales**	**Volume (Million pounds equivalent U_3O_8)**
Concentrates	73	18.0	63	23.0
UF_6	18	4.9	33	9.5
EUP	12	3.8	12	7.0
TOTAL[1]	**103**	**26.6**	**108**	**39.5**

[1] Due to independent rounding, columns may not equal total

The other major factor contributing to 1991's price decline was the abundance of supply. Unlike 1990 when low prices caused all but a few suppliers to withdraw from the market, in 1991 numerous suppliers continued to compete aggressively for sales even when market levels fell below $8 per pound. Supply was available from many sources, including utility, producer, and government stockpiles. Uranium inventories from Australia, Africa, Canada, China, Germany, Italy, the Soviet Union, Eastern Europe, and the USA all had an impact on the market at some time during 1991.

The spot conversion market edged up $0.10 during 1991, in a fairly quiet market. There were some supply concerns in the conversion market, but minimal demand negated any potential for a significant price increase.

The Loan Rate was unchanged throughout the year, remaining at 3.5 percent per annum. Loaned material continued to play an important role in the uranium market as utilities, producers, and other market participants sought to utilize excess inventories. Loan volume thus far in 1991 has exceeded 13 million pounds equivalent U_3O_8, a figure very nearly the same as last year's.

The SWU Value rose dramatically in 1991, starting the year at $51 per SWU, and rising to $68 per SWU by October 31. Marketing efforts by several enrichment suppliers, particularly the US Department of Energy (DOE), led many buyers into the market to examine SWU supply alternatives. Consequently, during the second and third quarter of this year, a large increase in SWU demand drove prices upward. Thus far in 1991, almost 3.2 million SWU have been traded in 33 near-term transactions, compared to only 1.7 million SWU last year by this time.

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NATURAL URANIUM

Near-Term Market Activity

The NUEXCO Exchange Value ended 1990 at $9.70 per pound U_3O_8, and, to most market participants' surprise or disbelief, had fallen to $7.25 per pound by October 31, 1991. When adjusted for inflation, market prices clearly had reached an all-time low. While the market showed some volatility during the year, including the recent upturn, the Exchange Value declined steadily during most of the year: $9.70 per pound at the end of 1990; $9.30 at the end of the first quarter 1991; $9.05 at the end of the second quarter; $8.40 at the end of the third quarter; and more recently $7.25 and $7.40. Many factors have affected the market this year, yet the overriding influence is the same as it has been for the past few years: supply has overwhelmed demand.

Annual uranium consumption has outpaced actual production for much of the past decade, but producer, utility, and government inventories have filled the balance of demand. Each year some forecasts indicate that inventories will soon be drawn down, yet each year new supplies are made available to the market. Initially, large utility and producer inventories in the USA and Europe met demand; then Western government stockpiles from countries such as Germany and Italy predominated; and more recently, uranium from China, the Soviet Union, and other East European countries have reached the market. With the end of the Cold War era, uranium from nuclear weapons stockpiles throughout the world may be the next major supply source. So while many may look for a scapegoat to blame for the record low price levels, the fact remains that low-priced supply from multiple sources is driving the market. Until these inventories are drawn down or otherwise designated for particular uses, a significant and lasting price recovery is not possible.

In addition to ample supply from numerous sellers and a preponderance of discretionary demand, several other factors affected the uranium market in 1991.

The fall of the Iron Curtain—As the Soviet Union and other East European countries have moved toward market-based economies, fungible exports such as uranium have taken on an important role in a country's transition. Uranium from these countries has been marketed to the Western world since the mid-1980s and enrichment services since the mid-1970s. Like other world suppliers, these countries have turned to the spot market to supplement their long-term marketing efforts.

Further evidence of abundant supply—Recent uranium discoveries, such as that at MacArthur River in Canada, reinforced the belief that supply was plentiful and has tended to alleviate concerns regarding long-term resource availability.

Lifting of sanctions against South Africa—South Africa's progress toward ending apartheid led most countries to lift economic sanctions in 1991. While South Africa's uranium production has dropped significantly in the past decade, the country still has large remaining reserves that are once again politically acceptable on the world market. This availability further reinforces the perception of abundant long-term supply.

Increasing number of spot market participants and the increasing role of traders—Spot market sales have acquired a larger and more important share of the total uranium market in recent years. More utilities, producers, and intermediaries than ever before are active in the spot market. The increased reliance on the spot market has actually made it even more secure, since traders, brokers, and other participants now have more alternatives by which to fill buyer or seller needs, without reducing security of supply.

Anti-dumping petition against the Soviet Union--On November 8, 1991, several uranium producers with US operations filed a petition with the US Department of Commerce and the US International Trade Commission charging that uranium is being dumped in the USA by the Soviet Union. This filing coincided with a firming of the market in November caused by an influx of discretionary buyers attracted by October's record low prices. Market participants reacted differently to the filing, but many viewed the petition as just another factor in an already uncertain market.

The UF_6 market was comparatively quiet in 1991. The UF_6 Value did not decrease as steadily as the Exchange Value, although the few UF_6 transactions that transpired during the year were greatly influenced by activity in the concentrates market. With such limited activity during the year, buyers and sellers of UF_6 looked to the component markets of concentrates and conversion to get an indication

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of current UF_6 market conditions. During the first half of the year, the UF_6 Value ranged from \$27.75 per kgU as UF_6 to \$27.25 per kgU. During the third quarter, it ranged from \$25.50 to \$26.25 per kgU. By fourth quarter 1991, the UF_6 Value was \$22.75 per kgU, as several suppliers competed for the very limited UF_6 demand.

Spot Market Volume

By the end of November 1991, 26.6 million pounds equivalent U_3O_8 had changed hands in 103 transactions. As shown in Table 1, this lags last years' volume by 12.9 million pounds. The bar chart in **Figure 1** shows 1991's year-to-date volume compared to total yearly volume from 1984-1990. Spot market volume this year will not surpass last year's record total of 40.1 million pounds. However, market volume has been significant thus far in December, and it is likely that total 1991 volume will surpass 1989's total of 32.3 million pounds.

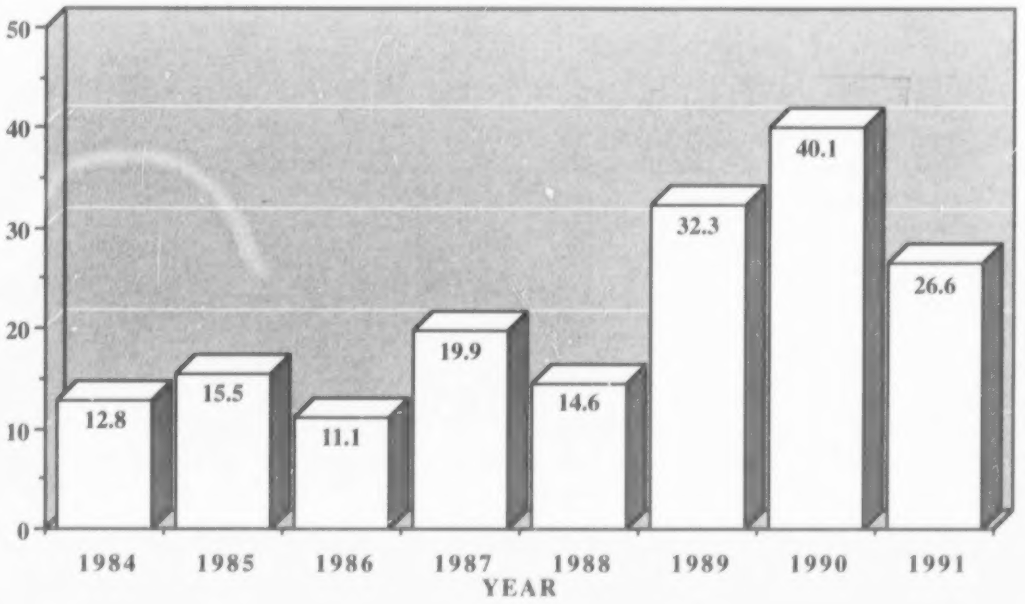
Thus far in 1991, 73 concentrates sales account for over two-thirds of total volume. UF_6 share of volume has fallen compared to 1990's share and accounts for about 18 percent of total uranium sales volume and 21 percent of natural uranium sales volume. Twelve near-term enriched uranium product (EUP) sales total almost 3.8 million pounds equivalent U_3O_8 and account for 14 percent of total market volume.

Sellers

Intermediaries have been the predominant sellers in the 1991 uranium spot market, selling over 20 million pounds equivalent U_3O_8 in 75 sales. Twelve near-term producer sales account for about ten percent of total volume, and sales by utilities, fabricators, converters, and enrichers combine for the balance.

Intermediaries' role as the dominant sellers in the market has evolved because most large supplies are held in utility or government inventories. These entities are typically

Figure 1
HISTORICAL NEAR-TERM URANIUM SALES VOLUME
(million pounds equivalent U_3O_8 – through November 1991)



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buyers who, lacking marketing expertise, tended quite naturally to turn to intermediaries for assistance in selling these inventories.

The predominance of intermediaries as sellers also can be attributed to the emergence of producers as buyers in today's market. With market prices lower than their production costs, producers often buy from intermediaries rather than producing the material themselves to fill long-term contract commitments. This not only provides more sales to intermediaries, but also increases intermediaries' relative share of total sales volume, as producers are buying, not selling.

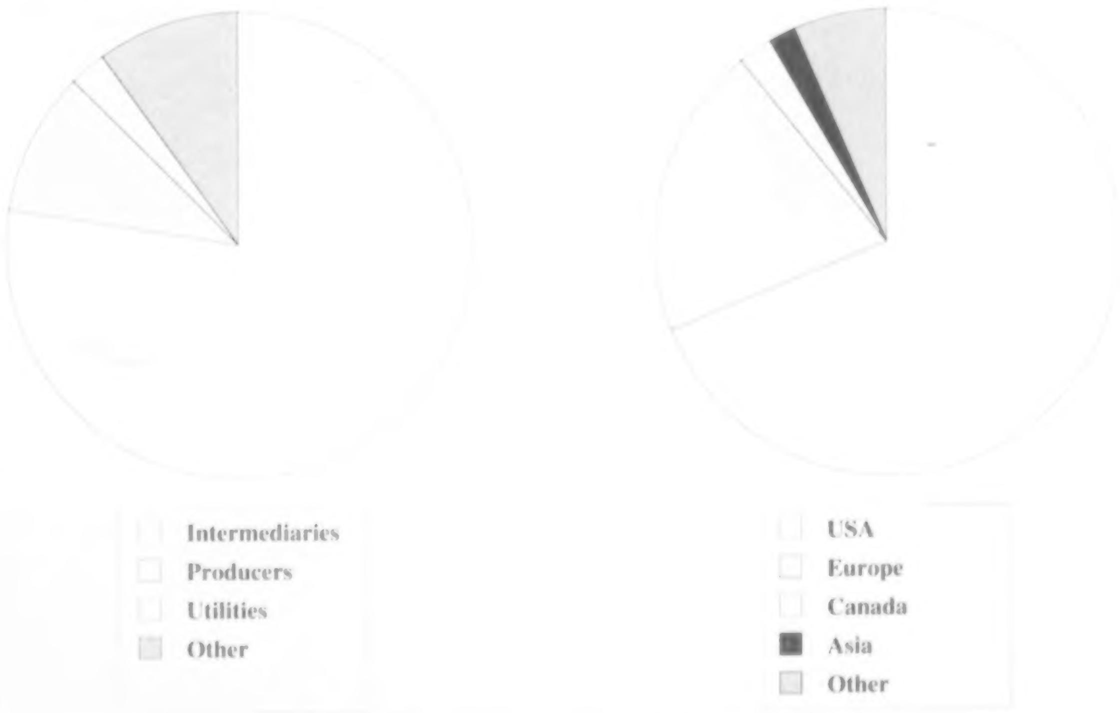
Most spot market activity in 1991 involved US entities as sellers. Nearly 70 percent of total uranium sales volume could be attributed to US-based sellers (**Figure 2**). European sellers accounted for over 20 percent of total volume, while Canadian, Asian, African, and unidentified sellers made up the balance.

Buyers

Utilities have been the most active buyers thus far in 1991, accounting for over 50 percent of all purchases. Producers have continued as important buyers, purchasing almost 28 percent of total spot market volume. As described earlier, most spot market purchases by producers were used to fill long-term contract commitments. Intermediaries accounted for about 20 percent of total volume, with fabricators and converters making up the small remaining balance (**Figure 3**).

Market activity in 1991 has been concentrated in the USA: US entities have made 70 purchases for almost 15 million pounds equivalent U_3O_8 or approximately 55 percent of total volume. European buyers account for about 21 percent of volume in 18 purchases. Canadian and Australian buyers together accounted for another 20 percent of the total. Asian, African, and unidentified buyers make up the balance. This high level of spot market activity in

Figure 2
1991 SELLERS BY TYPE AND ORIGIN



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the USA is not unusual, given that US utilities typically have placed less reliance on long-term contracts than their counterparts in Europe or Asia.

Long-Term Market Activity

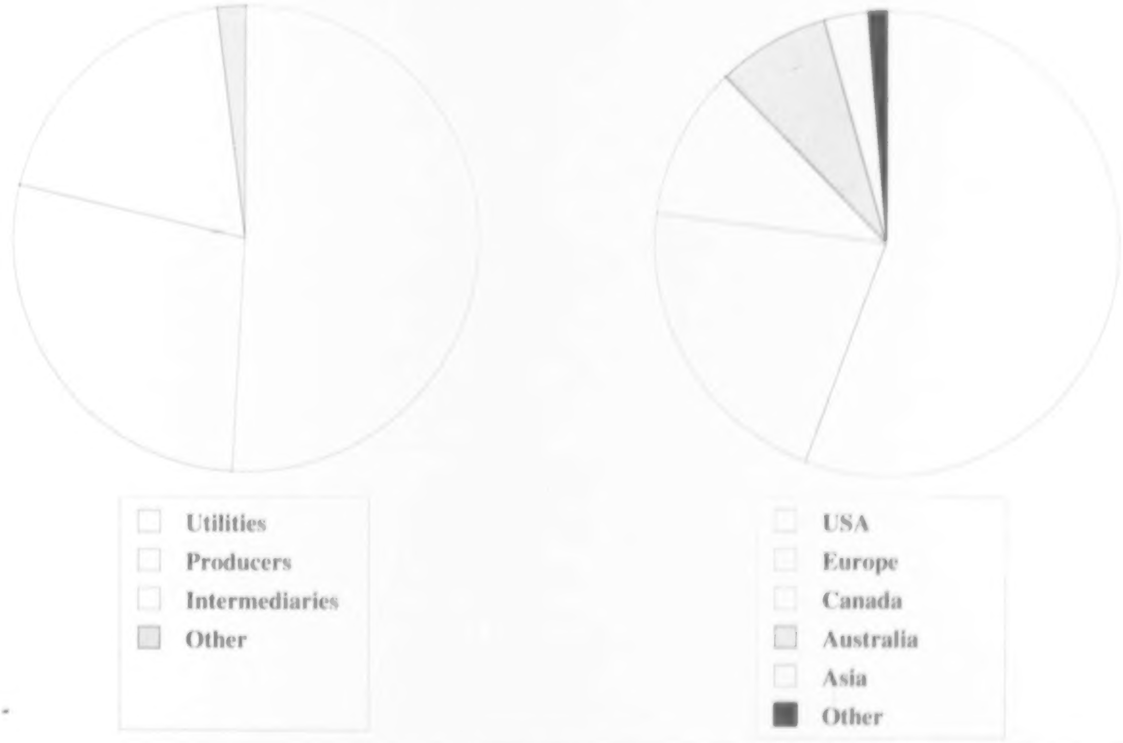
Long-term market activity in 1991 is comparable to spot market activity: while not matching last year's record pace, contracts for significant volumes of uranium were signed. Thus far in 1991, 40 long-term contracts have been concluded (33 involving concentrates, five for UF_6, and two for EUP). These sales total 38.3 million pounds equivalent U_3O_8 for delivery through 2001. Sales by producers account for 56 percent of the volume and intermediaries, for 36 percent; two sales have undisclosed sellers.

Unlike 1990 when the majority of new long-term contracts employed market-related pricing terms, sales in 1991 were fairly equally split among three types of terms: market-related (14 sales), base-price escalated (14 sales), and a series of fixed prices (12 sales).

As expected, utilities were the dominant buyers, purchasing almost 35 million pounds equivalent U_3O_8 in 36 transactions. Two intermediaries and two producers made comparatively small purchases to account for the remaining sales.

Most sales were made to US utilities, accounting for almost 62 percent of the long-term sales volume. In general, prices reflected the continuing downward movement of the spot market. In recent years, most long-term supply contracts signed in the USA have involved market-related terms, and while this trend is not as prevalent in Europe or Asia, contracting practices in the USA tend to be a bellweather of future trends in those regions.

Figure 3
1991 BUYERS BY TYPE AND ORIGIN



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CONVERSION

The Conversion Value, which had remained at \$1.45 per pound U as UF_6 for 14 consecutive months, moved up modestly to \$1.50 per pound U on May 31, 1991. After a period of adjustment, the Conversion Value settled at \$1.55 per pound U on September 30. This slight increase reflects the gradual reduction, during the second and third quarter of 1991, of the UF_6 supplies that were overhanging the market early in the year.

Only nine near-term conversion sales were reported through November 1991, totalling less than two million pounds U as UF_6. This is significantly less than the previous year's twenty sales for almost seven million pounds. The reduced volume can be attributed partially to the lack of demand in the UF_6 market, for in past years, deconversion sales contributed noticeably to total volume, as sellers looked to decouple the components of UF_6 to meet buyer needs. In 1991, while comparatively higher volumes of concentrates changed hands in the spot market, much of the material was converted under long-term contracts. In 1991's nine near-term conversion transactions, seven utilities and two intermediaries purchased conversion services from converters (4 sales), intermediaries (4 sales), and one unknown seller. Seven of the sellers were US entities, while buyers were two-thirds US and one-third European.

The long-term conversion market was more active, as eight sales were concluded, totalling almost 24 million pounds U as UF_6. Five utilities and three intermediaries purchased conversion services covering the period 1991 through 1997. Although total sales volume was very large, the average was skewed due to one large sale to a utility. Both buyers and sellers were predominantly US companies.

URANIUM LOANS

The Loan Rate remained at 3.5 percent per annum throughout the year. In fact, the Loan Rate has not changed since November 1987. By filling spot demand and thereby deferring purchases to a later date, uranium loans continued to be an important factor in the market . While the Loan Rate has been constant, in the latter half of this year it has been under some downward pressure from several key factors: low loan demand, a number of willing lenders, and a significantly lower interest rate structure in the USA. Nevertheless, most loans concluded during the year took place near the prevailing Loan Rate.

Seventeen natural uranium loans totalling over 13 million pounds equivalent U_3O_8 have been concluded so far in 1991. Fifteen loans involved concentrates; the remaining two involved natural UF_6. Intermediaries have been the primary borrowers, receiving material from 12 loans. Producers and utilities were the other borrowers. Most borrowers were from the USA (14 loans); Canada (2) and Europe (1) account for the balance.

Lenders have been quite diverse, and include utilities (9 loans), fabricators (3), intermediaries (2), producers (2), and converters (1). Origins of the lenders include the USA (10), Europe (6), and Asia (1).

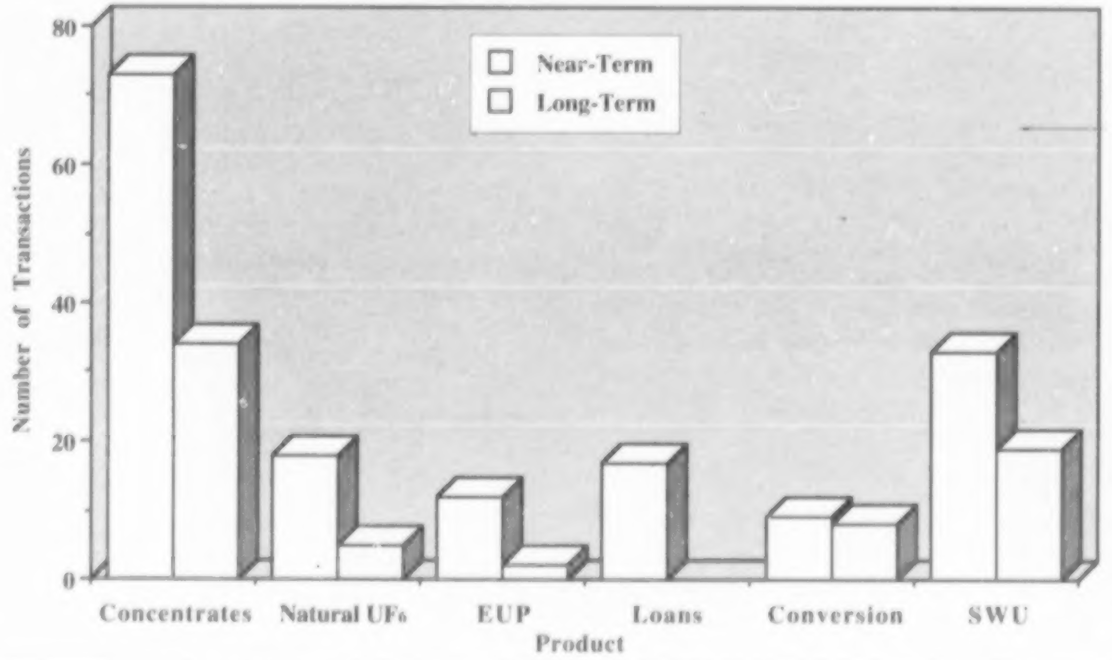
The loans reported involve only natural uranium, but NUEXCO is aware of at least seven EUP loans involving 1.4 million pounds equivalent U_3O_8 and over 300 thousand SWU.

ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

The SWU Value began 1991 at \$51 per SWU, edged upward during the first and second quarter, moving to \$59 per SWU on June 30, then jumping to \$66 on July 31. It has now slowed its ascent, and has remained at \$68 per SWU for the past two months. The driving force behind the spot enrichment market's rapid increase was large levels of SWU demand during the second and third quarter, which absorbed most of the available supply.

Many utilities, especially in the USA, began the year uncommitted for SWU supplies beyond 1995. Aggressive marketing efforts by several suppliers, in particular DOE, caused many utilities to enter the market to evaluate supply alternatives. Many options existed, including DOE's "enhanced IP3" and "SWU-power" offers, future production from Louisiana Energy Services or from CRISLA technologies, imports from Global Nuclear Services and Supply, Ltd. (GNSS), and numerous purchase strategies utilizing the spot SWU market. At least 42 utilities evaluated offers for near- and long-term supplies during 1991; in addition, at least 12 other buyers (fabricators, enrichers, intermediaries, etc.) also evaluated SWU offers during the year.

Figure 4
1991 YEAR-TO-DATE NUMBER OF TRANSACTIONS BY PRODUCT FOR BOTH NEAR-TERM AND LONG-TERM



Of course, not all buyers elected to make purchases, but 33 near-term SWU sales did occur, totalling almost 3.2 million SWU. Of these sales, twelve involved SWU contained in EUP for about 850 thousand SWU, and 21 involved only SWU for 2.3 million. Utilities purchased over 73 percent of the total volume; buyers were about equally split between the USA and Europe. Most near-term sellers were intermediaries or utilities. While the number of spot SWU sales was slightly in favor of US entities (18) over European companies (15), European firms sold over two-thirds of total spot SWU volume in 1991.

The long-term SWU market was quite active as well. Over 8.5 million SWU were contracted for in 19 transactions. Deliveries begin as early as 1992 and extend until 2002, although most sales call for delivery in 1996 and beyond. Enrichers edged out intermediaries as the primary sellers, but each accounted for sales of over four million SWU. North American entities sold about 56 percent of the SWU, while Europeans made up the balance. Buyers were exclusively utilities, and over 92 percent of total volume was sold to US utilities, with at least one US utility making a long-term commitment that involves a "power for SWU" arrangement with DOE. One European and one Asian utility also purchased long-term enrichment.

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WORLD ENRICHMENT REQUIREMENTS TO 2005

The following article contains information excerpted from the enrichment section of a NUEXCO study entitled Nuclear Fuel Market Analysis and Price Trend Projections. *It provides aggregated data on world uranium enrichment requirements and builds upon information presented in the* November 1991 Monthly Report *(No. 279, pp. 18-25) in an article entitled "World Nuclear Generating Capacity and Uranium Requirements". Specific enrichment requirements for individual countries and reactors, detailed information on specific suppliers, as well as price forecasts are published in the complete study which is available from* NUEXCO Information Services.

The primary enrichment suppliers—Eurodif, Techsnabexport, Urenco, and the US Department of Energy (DOE)—are positioning themselves to take advantage of the post-1995 market. Overall, unfilled requirements represent about 40 percent of world requirements in the year 2000. The USA will be the primary market, as US utilities' unfilled enrichment requirements account for over 60 percent of the world's total unfilled requirements. The enrichment market is moving toward more global competition, as each supplier tries to maintain its current regional market base and then to capture additional market share in other regions.

ENRICHMENT SERVICES REQUIREMENTS

NUEXCO's world enrichment requirements are based upon projected installed nuclear electric generating capacity. (The many factors considered in developing these projections are discussed in last month's article.) World generating capacity is forecast to grow at an average rate of 2.4 percent per year, and reach 448 gigawatts electric (GWe) by 2005. From these forecasts, projected enrichment requirements total 38.6 million SWU by 2005 for all countries that have announced nuclear programs. Enrichment requirements for programs other than civilian nuclear power are not covered. **Table 1** below provides a list of all countries included in the analysis, grouped into regions. Countries not listed are not projected to have an operating nuclear plant before 2005.

All projections in the study were made for low growth, high growth, and reference case scenarios. This article summarizes only the reference case. That scenario assumes some slippage of construction progress from announced schedules of reactors under construction, and also assumes that most reactors whose construction has been halted eventually will be cancelled.

Table 1
COUNTRIES INCLUDED

Eastern Europe	Western Europe	Far East	United States	Other Countries
Bulgaria	Belgium	China[1]	USA	Argentina
CSFR[2]	France	Japan		Brazil
Finland	Germany	South Korea		Canada
Hungary	Italy	Taiwan		Cuba
Poland	The Netherlands			Egypt
Romania	Spain			India
Soviet Union	Sweden			Israel
Yugoslavia	Switzerland			Mexico
	UK			Pakistan
				South Africa

[1] China: refers to the People's Republic of China

[2] CSFR: Czech and Slovak Federal Republic, formerly Czechoslovakia

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Tails Assay and Capacity Factor

A significant factor directly affecting projected enrichment requirements is the tails assay. NUEXCO's calculations include an optimization for this value. The tails assay in each year is selected so as to minimize the cost of enriched uranium product based on the projected prices of uranium, conversion, and enrichment services. In this study, the optimization yielded a tails assay in excess of 0.3 weight-percent (w/o) U^{235} in almost all years. The nominal maximum tails assay allowed by most enrichers is 0.3 w/o. Therefore, in keeping with this constraint, a tails assay of 0.3 w/o was used consistently in the calculation of enrichment requirements.

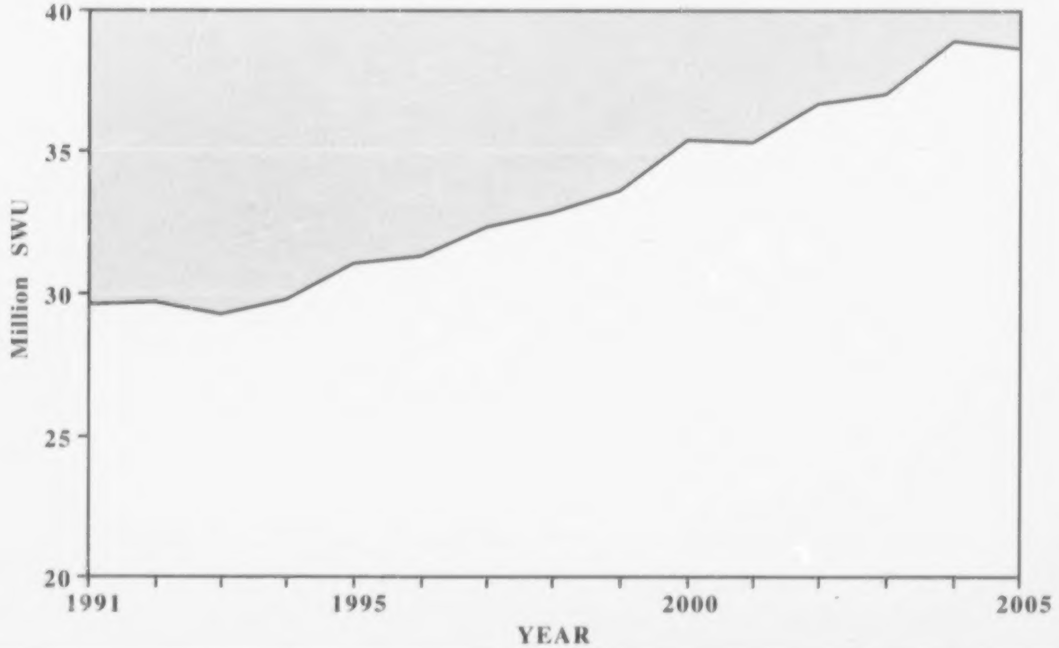
Another important factor in determining enrichment requirements is the capacity factor of each reactor worldwide. Reactor capacity factor (CF) is defined as the ratio of actual electric production over a period of time, to the theoretical maximum production that could have been obtained had the reactor operated at full power 100 percent of the time. Plant-by-plant capacity factors throughout the world were compiled and analyzed. The individual reactor capacity factors were processed to yield an average capacity factor for that reactor for the last three years: 1988, 1989, and 1990. This average was used as the projected capacity factor in 1991 for that reactor. Capacity factors for Bulgaria, CSFR, and the Soviet Union were based on a two-year average of 1988 and 1989.

In order to allow for reasonable future improvements in plant operating reliability, the capacity factor of each reactor is assumed to increase each year as a ramp function toward a maximum feasible capacity factor for that reactor type. This improvement function depends upon the specific characteristics of the reactor, such as whether it refuels on-line or shuts down for refueling. The function also allows for greater increases from reactors that have lower average CFs, and smaller increases from high CF plants, to reflect that each incremental improvement in capacity factor becomes more difficult as a plant approaches a maximum feasible capacity factor. This approach results in an aggregated capacity factor for the world of about 70 percent in 1991, increasing to about 73 percent in 2000, and 74 percent in 2005.

Enrichment Requirements

Projected world enrichment requirements through 2005 are shown in **Figure 1**. These total estimated requirements, excluding any reductions that may result from the

Figure 1
PROJECTED WORLD ENRICHMENT REQUIREMENTS THROUGH 2005



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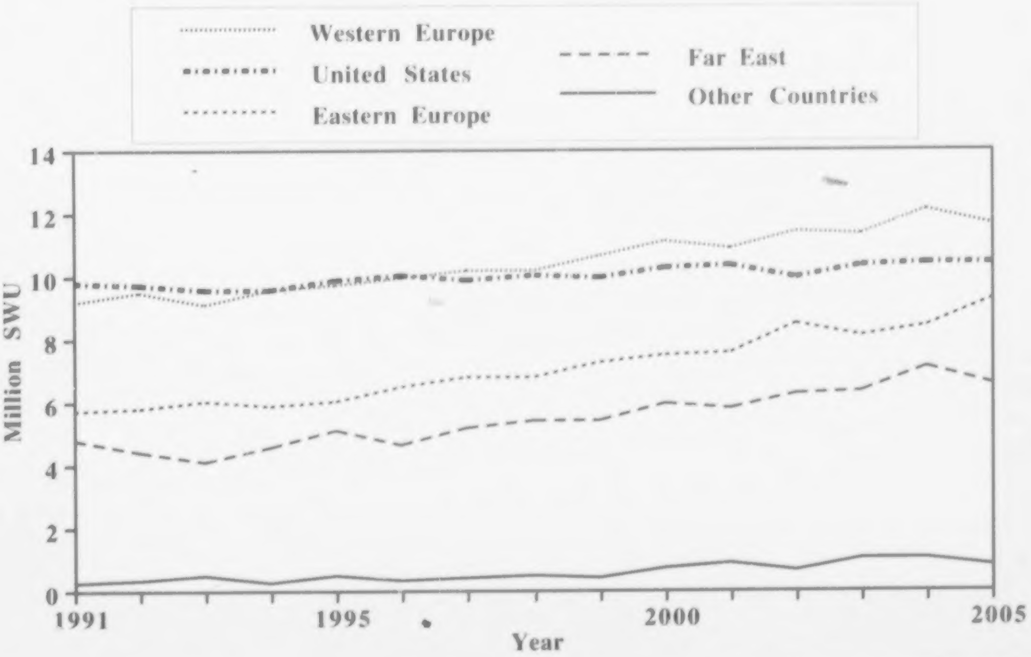
reprocessing or recycling of plutonium, are 29.6 million separative work units (SWU) in 1991, increasing to 35.4 million SWU in 2000, and to 38.6 million SWU in 2005. This represents an average annual growth rate of about two percent from 1991 to 2000.

Enrichment requirements by region are provided in **Table 2**. Due to the preponderance of heavy-water moderated reactors (which operate on natural uranium) in Other Countries, these countries as a group consume relatively small amounts of enrichment services, despite their rapid growth rate. **Figure 2** depicts the projected enrichment requirements by region for the reference case scenario. In aggregate, a low-growth scenario would reduce projected world enrichment requirements by an average of seven percent, whereas a high-growth scenario could boost requirements by over five percent through the year 2000.

Table 2
PROJECTED URANIUM ENRICHMENT REQUIREMENTS

Region	**Million SWU**		**Growth (1991 to 2000)**		
	1991	**2000**	**Million SWU**	**Percent**	**Percent/Year**
Eastern Europe	5.7	7.4	1.7	31	3.0
Western Europe	9.1	11.0	1.9	21	2.1
Far East	4.8	6.0	1.2	24	2.4
United States	9.8	10.3	0.5	5	0.5
Other Countries	0.2	0.7	0.5	243	13.8
Total World	**29.6**	**35.4**	**5.8**	**20**	**2.0**

Figure 2
PROJECTED WORLD ENRICHMENT REQUIREMENTS BY REGION



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Unfilled Requirements

In 1995, unfilled requirements represent about five percent of world enrichment requirements, and grow to about 40 percent by 2000. The bar chart in **Figure 3** shows world requirements segregated into filled and unfilled portions, and illustrates the growing amount of unfilled requirements.

As of April 1, 1991, utilities holding 36 enrichment contracts gave DOE their notices to terminate all or a portion of their committed requirements for FY 2000 and FY 2001. As a result, unfilled requirements in the USA increase from 0.8 million SWU in 1995, to almost 9 million SWU by the year 2000. Cumulatively, unfilled requirements from the USA accounts for over 60 percent of the world's unfilled requirements for the years 1996-2000.

ENRICHMENT SUPPLY

The enrichment market can be best characterized as having excess production capacity compared to demand. The primary suppliers of uranium enrichment services are located in the USA, Europe, and the Soviet Union. **Table 3** lists the world's enrichment suppliers, their plants, enrichment processes, and nameplate capacity. World enrichment capability is estimated at about 38 million SWU per year, including the Soviet Union, China, and several smaller enrichment programs worldwide.

In FY 1991, DOE produced about 11 million SWU, significantly less than its nameplate capacity of 19.2 million. Eurodif and Techsnabexport also are projected to produce below their capacity this year. The chart in **Figure 4** shows western suppliers' nameplate SWU production capacity relative to their expected level of production in 1991.

Figure 3
PROJECTED WORLD UNFILLED ENRICHMENT REQUIREMENTS

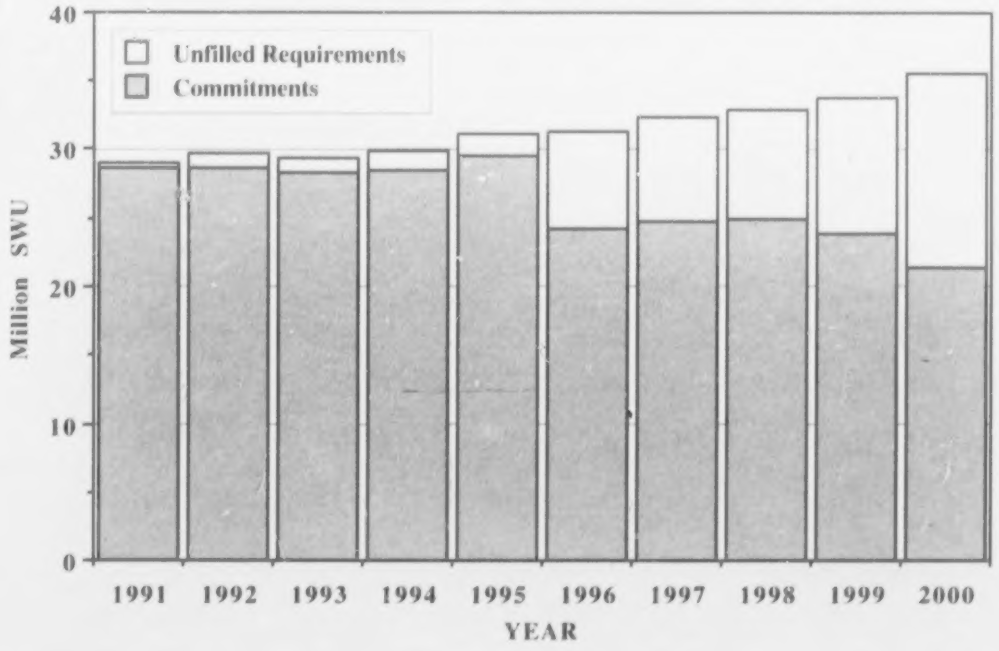

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Table 3
WORLD ENRICHMENT SUPPLERS

Supplier	Plant	Enrichment Process	Initial Production Began	Nameplate Capacity (Million SWU/yr)
USDOE	Paducah, Kentucky	Gaseous Diffusion	1954	11.3
	Portsmouth, Ohio	Gaseous Diffusion	1956	7.9
				19.2
TENEX	Sverdlovsk, Soviet Union	Gaseous Diffusion [1]	1949	na
	Sverdlovsk, Soviet Union	Centrifuge	1957 [2]	na
	Tomak, Soviet Union	Centrifuge	1957 [2]	na
	Krasnoyarsk, Soviet Union	Centrifuge	1957 [2]	na
	Angarsk Soviet Union	Centrifuge	1957 [2]	na
				4.0 [3]
Eurodif	Georges Besse, France	Gaseous Diffusion	1979	10.8
Urenco	Capenhurst, United Kingdom	Centrifuge	1976	0.7
	Almelo, The Netherlands	Centrifuge	1976	1.5
	Gronau, Germany	Centrifuge	1985	0.5
				2.6
PRC	People's Republic of China	Gaseous Diffusion	na	0.5 [4]
South Africa	Valindaba	Helikon	1986	0.3
Japan	Rokkasho-mura	Centrifuge	1988	0.2
Other	Argentina	Gaseous Diffusion/Centrifuge	1990	na
	Brazil	Gaseous Diffusion/Centrifuge	1990	na
				0.2
TOTAL				**37.8**

na = not available

[1] NUEXCO believes the final operating GDP was closed in 1990.

[2] The Soviet Union's centrifuge-based production began in 1957, although exactly which plant(s) began production in 1957, and the subsequent years that production began for the remaining plants, is unavailable.

[3] NUEXCO has estimated the Soviet Union has 4 million SWU currently available for export.

[4] The only available production capacity figure for the People's Republic of China is the available capacity for export purposes.

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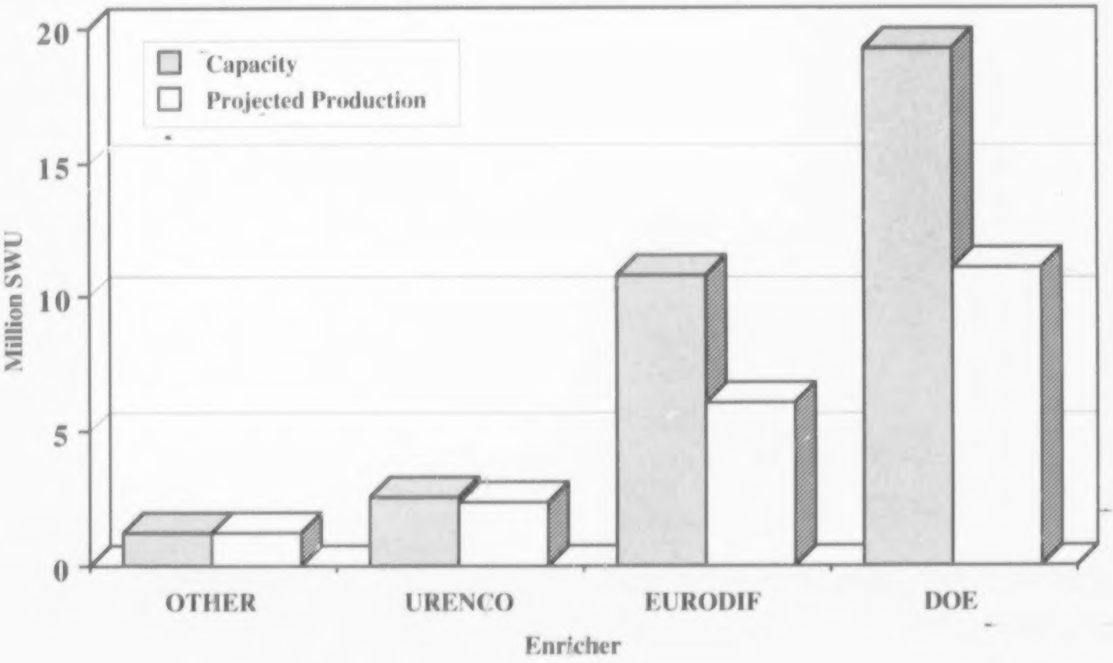
Figure 4
WESTERN WORLD ENRICHMENT SUPPLIERS' NAMEPLATE PRODUCTION CAPACITY AND ESTIMATED 1991 PRODUCTION



NUEXCO projects this production overcapacity to continue beyond 2005. Nevertheless, new capacity may be added during the 1990s, as new suppliers plan to have a cost advantage. This additional capacity includes 1.5 million SWU per year by Louisiana Energy Services, 250 thousand SWU per year by CRISLA Technologies by the mid-1990s, and further capacity additions in Japan. Countries such as Argentina and Brazil are also in various stages of enrichment deployment; however, this supply will be used domestically and will impact the world enrichment market only by reducing total demand.

Enrichment Technologies

The two major processes currently used to enrich uranium are gaseous diffusion and gas centrifuge. The diffusion process involves the flow of gaseous uranium hexafluoride through a cascade of porous diffusion barriers. The U^{235} isotope, being lighter than the U^{238} isotope, passes through the barriers in greater quantities. Thus each passage results in a small degree of enrichment. The diffusion process is used in the United States by DOE and in France by Eurodif.

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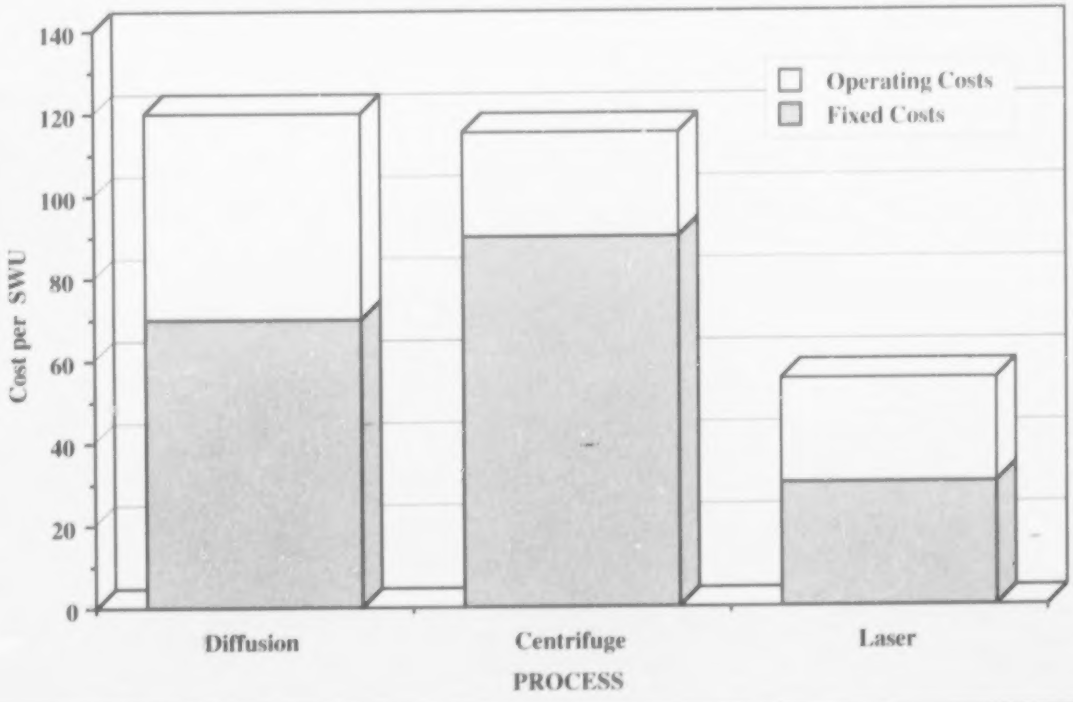
The centrifuge process involves spinning uranium hexafluoride (UF_6) gas at high rotational speeds (between 40,000 and 50,000 revolutions per minute) forcing the U^{238} toward the perimeter, and leaving the U^{235} concentrated near the axis. The centrifuge process requires substantially less energy than gaseous diffusion. This process is used by Urenco in Britain, Germany, and The Netherlands, and by Techsnabexport in the Soviet Union. The Japanese have a pilot centrifuge plant and are constructing a small, modular commercial plant, both of which are producing small quantities of SWU.

Both the traditional methods of uranium enrichment—gaseous diffusion and centrifuge isotope separation—are based on the difference in atomic mass of uranium isotopes. Because a UF_6 molecule containing a U^{238} atom is less than one percent heavier than its U^{235} counterpart, the separation factor of each enrichment stage is very small, and it takes a large number of stages to achieve the product enrichments necessary for civilian nuclear reactors, resulting in higher enrichment costs.

New enrichment processes that use lasers on either an atomic or molecular scale, are being developed and could lower costs in the future. Laser enrichment represents a radical departure from the traditional diffusion or centrifuge approach. Laser separation systems are based on the difference in quantum energy levels of the various isotopes. Finely tuned laser light is used to excite only the desired isotope to a higher energy level, causing this isotope to behave differently, which leads to its separation. For example, in the Atomic Vapor Laser Isotope Separation (AVLIS) system, U^{235} atoms are selectively excited to the ionization level where they can be separated by means of an electromagnetic field. Similarly, the Chemical Reaction by Isotope Selective Laser Activation (CRISLA) process uses lasers to excite U^{235} atoms to a state where, instead of being separated by an electric field, the atoms chemically react more readily with a scavenging gas.

Figure 5
ESTIMATED COSTS OF ENRICHMENT PROCESSES



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In both of these photo-excitation processes, the difference in the quantum energy jumps between uranium isotopes is very small, typically less than one part in 100,000. As the energy in light is proportional to its frequency, the use of lasers with very narrow frequency line widths is necessary to selectively excite the U^{235} atoms. The AVLIS system has been proven in theory and the laboratory; large-scale prototype testing of this laser process is planned for 1992 in the USA (AVLIS) and after the year 2000 in France (SILVA). Once these laser methods progress to commercial operation, they likely will have a significant cost advantage over traditional methods (**Figure 5**).

CONCLUSION

World enrichment requirements are expected to grow steadily into the next century. While the market already is characterized by excess capacity, additional capacity is still planned for operation by the late 1990s. Consequently, supply will remain abundant and production costs will become an increasingly important factor in a competitive market. Traditional methods of gaseous diffusion and gas centrifuge will remain the primary means of production, although laser methods, once in full-scale operation, should begin to capture a sizeable market share because of their projected cost advantage.

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NUCLEAR INDUSTRY CALENDAR

1992

Feb. 23-25 *INFO Centers Workshop* (Marriott Hotel, Palm Beach Gardens, Florida).
Sponsored by the U. S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

March 22-25 *Fuel Cycle Conference '92* (OMNI Charleston Hotel, Charleston, South Carolina).
Sponsored by the U. S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

April 8-10 *Research and Development in the Nuclear Industry* (Peterhouse, University of Cambridge, England).
Sponsored by the Institution of Nuclear Engineers and the British Nuclear Forum.
Contact: Ms. Ipek Yigit, Manager for Public and Industrial Affairs, British Nuclear Forum; phone: 071-828-0116; Fax: 071-828-0110; Address: 22 Buckingham Gate, London, SW1E 6LB, England.

April 12-16 *8th Pacific Basin Conference* (Taipei, Taiwan).
Sponsored by the American Nuclear Society.
Contact: ANS Meetings Department; 708-352-6611.

April 26-28 *INFO '92 Conference* (OMNI Charlotte Hotel, Charlotte, North Carolina).
Sponsored by the U. S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

May 5-7 *Annual Meeting on Nuclear Technology '92* (City Conference Hall, Karlsruhe, Germany).
Sponsored by the German Nuclear Society and the German Atomic Forum.
Contact: Congress Office JK'92; INFORUM GmbH, Heussallee 10, W-5300 Bonn 1; Phone: 0228-507-223.

Sept. 20-23 *International Uranium Seminar '92* (Hyatt Regency Hotel, Lake Tahoe, Nevada).
Sponsored by the U. S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

Sept. 21-23 *Second International Conference on Training for Operation & Maintenance in the Nuclear Industry*
(The Moat House International Hotel, Stratford-upon-Avon, United Kingdom).
Sponsored by the Institution of Nuclear Engineers.
Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.

Nov. 15-18 *Nuclear Energy Forum* (Fairmont Hotel, Chicago, Illinois).
Sponsored by the U. S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

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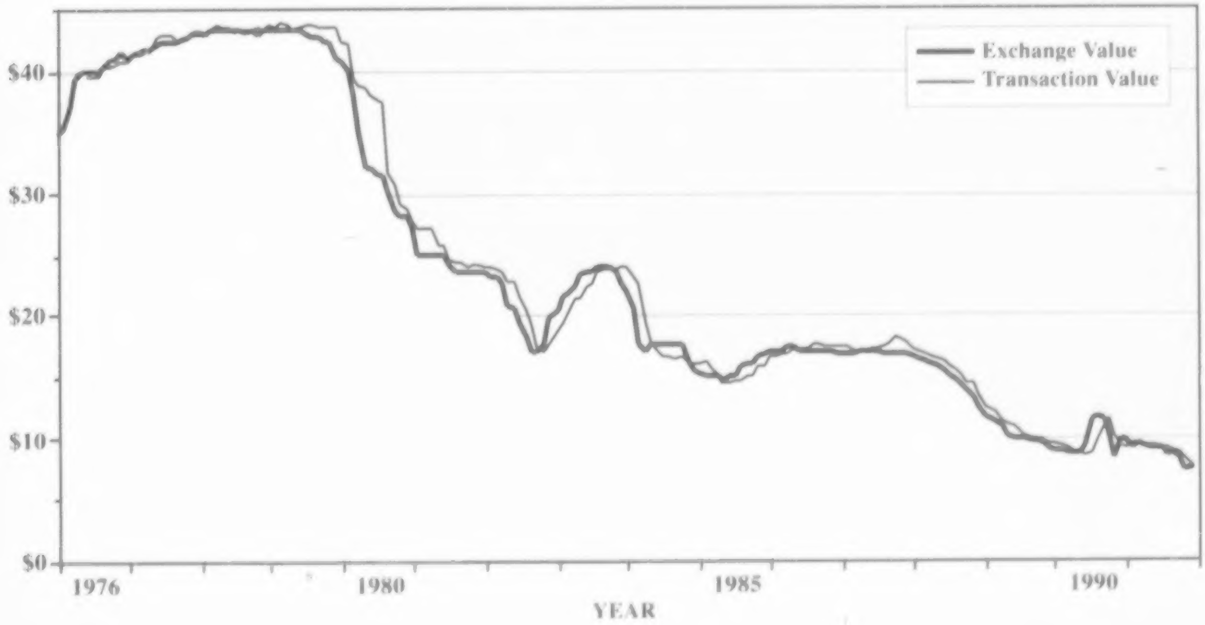
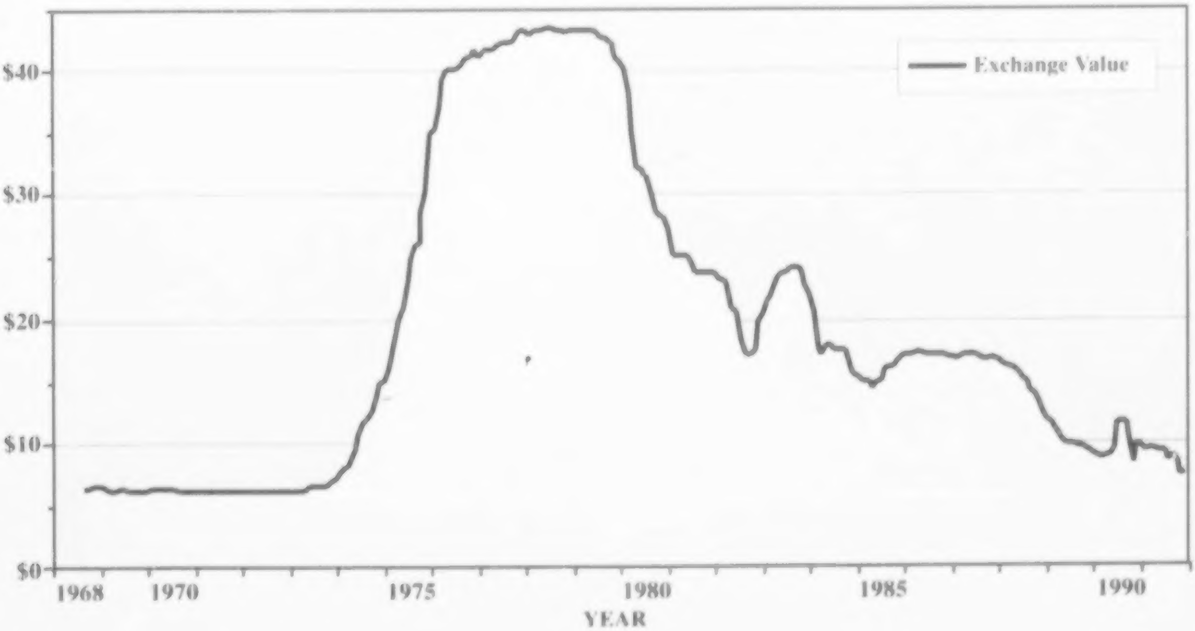
NUEXCO HISTORICAL EXCHANGE VALUE AND TRANSACTION VALUE

(in US dollars per pound U_3O_8)





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HISTORICAL MARKET VALUES

Exchange Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	9.80	9.70
1991	9.10	9.50	9.30	9.10	9.20	9.05	8.55	8.75	8.40	7.25	**7.40**	

US Premium (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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HISTORICAL MARKET DATA

UF$_6$ Values

Determined as of the last day of the month indicated ($US/kg U as UF$_6$)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29.50	24.75	28.75	28.75
1991	27.50	27.75	27.50	27.25	27.60	27.25	25.75	26.25	25.50	22.75	**22.75**	

US Premium (Relative to the UF$_6$ Value)

Determined as of the last day of the month indicated ($US/kg U as UF$_6$)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

Conversion Values

Determined as of the last day of the month indicated ($US/lb U as UF$_6$)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
1991	1.45	1.45	1.45	1.45	1.50	1.50	1.50	1.60	1.55	1.55	**1.55**	

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Transaction Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.33	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	9.30	9.15
1991	9.40	9.45	9.35	9.30	9.30	9.20	9.15	8.95	8.70	8.35	**7.45**	

SWU Values

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	51	51
1991	51	50	52	52	54	59	66	67	67	68	**68**	

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HISTORICAL MARKET DATA

Loan Rates

Year	Determined as of the last day of the month indicated (Percent per Annum) Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.[illegible]0	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1991	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	**3.50**	

* Float with Prime Rate

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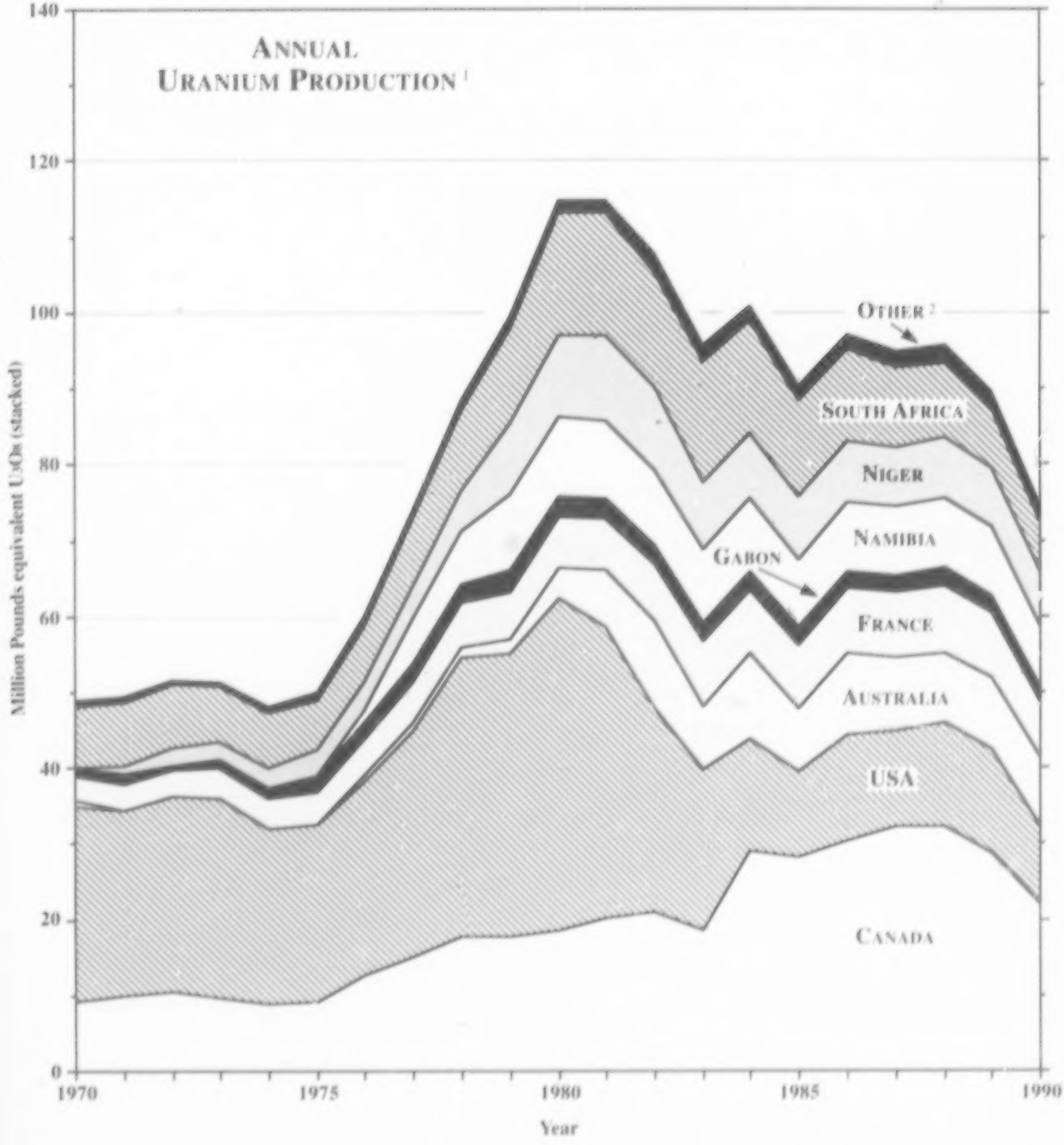

[1] Estimated world uranium production in 1990 totalled 74.5 million pounds equivalent U_3O_8 —
(Australia: 9.1 – Canada: 22.0 – France: 7.4 – Gabon: 1.8 – Namibia: 8.0 – Niger: 7.4 – South Africa: 6.4 – USA: 10.2 – Other[2]: 2.2)

[2] **Other** includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, western Germany, and Yugoslavia

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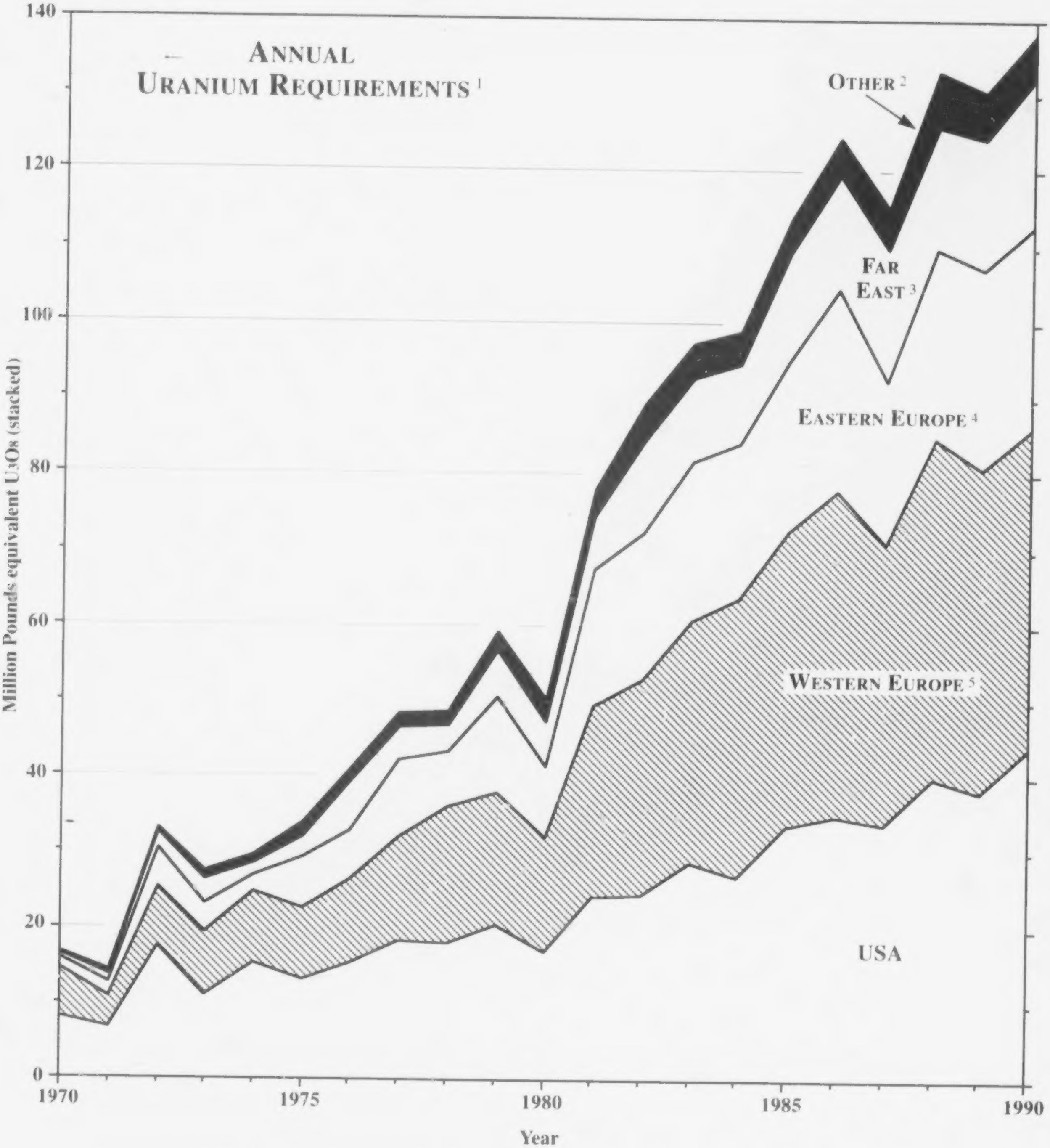
HISTORICAL MARKET DATA



[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assay.

[2] **Other** includes: Argentina, Brazil, Canada, India, Mexico, Pakistan, and South Africa.

[3] **Far East** includes: Japan, People's Republic of China, South Korea, and Taiwan.

[4] **Eastern Europe** includes: Bulgaria, Czechoslovakia, E. Germany, Finland, Hungary, USSR, and Yugoslavia.

[5] **Western Europe** includes: Belgium, France, W. Germany, Italy, The Netherlands, Spain, Sweden, Switzerland, and UK.

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Australia

Year	Period [1]	Consumer Price Index [2] (1980/1981 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups [3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia [4] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates [5] (June 1985=100)
1980	Avg.	95.8	83.1	—	69.6
1981	Avg.	105.0	85.9	—	76.1
1982	Avg.	116.7	89.0	—	86.4
1983	Avg.	128.5	96.9	—	89.9
1984	Avg.	133.6	98.0	—	96.0
1985	Avg.	142.6	107.3	—	100.0
1986	Avg.	155.5	101.5	—	104.9
1987	Avg.	168.7	108.9	465.88	112.9
1988	Avg.	180.9	111.8	496.90	115.4
1989	Avg.	194.6	117.0	534.65	126.0
1990	Avg.	208.7	123.4	571.43	129.6
Jan	1990	—	119.2	—	128.3
Feb	1990	—	120.8	555.80	128.3
Mar	1990	204.1	121.5	—	128.7
Apr	1990	—	119.9	—	129.0
May	1990	—	118.9	566.60	129.2
June	1990	207.4	116.6	—	129.8
July	1990	—	116.4	—	129.9
Aug	1990	—	122.4	574.10	130.0
Sept	1990	208.9	128.2	—	130.3 **R**
Oct	1990	—	134.1	—	130.4
Nov	1990	—	133.7	589.20	130.5 **R**
Dec	1990	214.5	128.8	—	130.6
Jan	1991	—	125.6	—	130.6
Feb	1991	—	121.5	597.70	130.6
Mar	1991	214.1	119.1	—	130.9 **R**
Apr	1991	—	117.6	—	131.1 **R**
May	1991	—	117.8	592.00	131.1 **R**
June	1991	214.4	120.4	—	131.1 **R**
July	1991	—	120.4	—	131.1 **R**
Aug	1991	—	119.9	—	131.4 **R**
Sept	1991	—	118.3	—	131.6

P = Preliminary **R** = Revised since last month

[1] Monthly data for the period 1967 to 1990 appears in Report 278.

[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1980 to June 1981 = 100.0). Figures shown at end of quarter represent quarterly average.

[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0).

[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (Catalogue No. 6312.0). Figures for the latest fourteen months shown are subject to revision.

[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (Catalogue No. 6302.0).

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Canada

		Industrial Products Price Index: All Commodities[1] (1986 = 100)[2]	Consumer Price Index: All Items (1986 = 100)[3]	Wage-earner Data: Average Hourly Earnings (C$)[4]				
				Uranium Mines (SIC 057)	Metal Mines (SIC 051-059)	Mines, Quarries and Oil Wells (SIC 051-099)	Metal Rolling, Casting and Extruding (SIC 298)	Chemicals and Chemical Products Industries (SIC 372-379)
1980	Avg.	75.9	67.2	-.-	-.-	-.-	-.-	-.-
1981	Avg.	83.6	75.5	-.-	-.-	-.-	-.-	-.-
1982	Avg.	89.0	83.7	-.-	-.-	-.-	-.-	-.-
1983	Avg.	92.1	88.5	17.22	14.86	14.18	10.67	11.09
1984	Avg.	96.3	92.4	17.89	15.85	14.97	11.11	11.68
1985	Avg.	99.0	96.0	18.53	16.47	15.56	11.85	12.12
1986	Avg.	100.0	100.0	19.38	16.70	15.76	12.28	12.58
1987	Avg.	102.8	104.4	20.12	17.15	16.11	12.58	13.20
1988	Avg.	107.2	108.6	20.91	18.51	16.95	13.17	13.77
1989	Avg.	109.4	114.0	21.97	20.02	18.41	13.71	14.16
1990	Avg.	109.7	119.4	22.90	20.93	19.12	14.62	15.28
Jan	1990	108.7	116.9	21.88	20.39	19.03	13.99	14.78
Feb	1990	109.5	117.6	22.51	20.63	19.14	14.49	15.03
Mar	1990	109.3	118.0	22.52	20.75	19.17	14.99	15.07
Apr	1990	109.1	118.1	~~23.17~~	21.20	19.46	14.83	14.93
May	1990	109.6	118.7	23.28	20.55	19.01	14.71	15.06
June	1990	109.4	119.2	21.85	20.63	18.96	14.69	15.05
July	1990	109.1	119.8	20.92	20.18	18.66	14.34	15.20
Aug	1990	109.3	119.8	23.88	20.51	18.59	14.50	15.33
Sept	1990	110.2	120.2	24.41	21.19	18.94	14.48	15.63
Oct	1990	110.6	121.2	23.11	21.39	19.12	14.78	15.59
Nov	1990	110.9	121.9	23.38	21.83	19.48	14.93	15.73
Dec	1990	111.0	121.8	23.90	21.89	19.88	14.7	16.01
Jan	1991	111.1	125.0	23.79	21.79	19.78	14.66	15.89
Feb	1991	110.6	125.0	25.23	22.45	20.13	14.63	16.10
Mar	1991	109.8	125.5	24.19	22.22	20.27	15.21	16.47
Apr	1991	109.1	125.5	24.77	22.50	20.31	14.63	16.64
May	1991	108.6	126.1	24.38	22.17	20.25	15.05	16.55
June	1991	108.5	126.7	23.58	22.13	19.90	14.65	16.51
July	1991	108.2	126.8	24.70	22.33	19.93	14.56	16.36
Aug	1991	107.8	126.9	23.78 **R**	22.01 **R**	20.00 **R**	14.62 **R**	16.24 **P**
Sept	1991	107.6	126.7	24.23 **P**	22.28 **P**	20.49 **P**	14.82 **P**	16.36 **P**
Oct	1991	107.6	126.5	-.-	-.-	-.-	-.-	-.-

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1990 is found in Report 278.

[2] New Base Year of 1986 as of Report 266. Previous Base Year was 1981.

[3] New Base Year of 1986 as of Report 264. Previous Base Year was 1981.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1990 is found in Report 278.

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South Africa

		Average Declared Working Costs per Metric Ton of Gold Ore Milled[1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled[2] (March 1982 = 100)	Consumer Price Index[3] (1990 = 100)	Production Price Index All Groups[4] (1985 = 100)	Total Employment in Mining and Quarrying[5]	Total Salaries and Wages in Mining and Quarrying[5] (1,000 Rand)
							Annual Total[6]
1980	Avg.	35.50	—	25.5	55.2	709,042	2,237,689
1981	Avg.	41.87	—	29.4	62.7	722,918	2,756,928
1982	Avg.	47.23	103.9	33.7	71.4	702,041	3,181,584
1983	Avg.	51.88	115.0	37.8	79.0	700,901	3,563,282
1984	Avg.	58.95	130.3	42.2	85.6	711,511	4,134,390
1985	Avg.	68.70	151.7	49.1	100.0	724,587	4,778,612
1986	Avg.	80.18	177.9	58.2	119.6	756,637	5,767,950
1987	Avg.	95.01	223.1	67.6	136.2	751,864	6,911,395
1988	Avg.	106.69	241.1	76.2	154.1	705,355	7,774,054
1989	Avg.	116.65	273.0	87.4	177.5	700,360	8,833,934
1990	Avg.	129.37	305.3	100.0	198.9	677,742	10,193,209
							Monthly Total
Jan	1990	—	—	94.2	188.9	688,837	801,616
Feb	1990	—	—	94.8	190.3	674,026	767,274
Mar	1990	126.74	296.3	96.4	190.8	704,660	780,614
Apr	1990	—	—	97.3	194.1	696,107	810,474
May	1990	—	—	98.3	196.6	613,527	719,191
June	1990	128.25	299.87	99.0	197.2	676,621	841,165
July	1990	—	—	99.7	197.3	697,242	913,177
Aug	1990	—	—	101.3	199.4	686,385	902,392
Sept	1990	129.46	312.55	102.9	202.2	689,317	922,454
Oct	1990	—	—	103.6	205.5	676,833	882,603
Nov	1990	—	—	105.8	212.7	669,198	909,418
Dec	1990	133.02	312.37	106.5	212.0	660,151	942,831
Jan	1991	—	—	107.7	216.1	648,944	935,839
Feb	1991	—	—	109.0	216.9	650,948	893,373
Mar	1991	137.66	323.82	110.0	215.3	651,843	924,930
Apr	1991	—	—	111.5	216.5	639,939	887,722
May	1991	—	—	113.2	218.4	630,481	887,107
June	1991	134.65	317.23	114.0	219.3	653,134	890,595
July	1991	—	—	115.5	221.2	637,581	878,147
Aug	1991	—	—	117.1	222.8	—	—
Sept	1991	137.11	329.05	118.7	225.2	—	—
Oct	1991	—	—	121.0	—	—	—

P = Preliminary **R** = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in Report 278.

[2] Page 16 of Report 178 contains description and calculation of index.

[3] Central Statistical Service, Pretoria: All income groups-weighted average. Historical Data by month appears in Report 278.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in Report 236.

[6] Annual total is shown, rather than monthly average, for indicated year.

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United States

		Producer Price Index[1]				Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
		Industrial Commodities (1982 = 100)	**All Commodities (1982 = 100)**	**Consumer Price Index[2] (1982-1984 = 100)**	**GNP Implicit Price Deflator[3] (1982 = 100)**	**Metal Mining (SIC 10)**	**Primary Non-ferrous Metals (SIC 333)**	**Chemicals and Allied Products (SIC 28)**	**Electric and Electronic Equipment (SIC 36)**
1980	Avg.	88.0	89.8	82.4	85.7	10.26	10.63	8.31	6.94
1981	Avg.	97.4	98.0	90.9	94.0	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	100.0	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	103.9	12.58	13.43	10.58	8.66
1984	Avg.	103.3	103.7	103.9	107.7	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	110.9	13.38	13.74	11.57	9.46
1986	Avg.	100.0	100.2	109.6	113.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	117.7	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	121.3	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	126.3	13.59	13.72	13.09	10.05
1990	Avg.	115.8	116.3	130.7	131.5	14.10	14.36	13.54	10.32
Jan	1990	114.1	114.9	127.4	—	13.69	13.95	13.34	10.13
Feb	1990	113.6	114.4	128.0	—	13.70	13.99	13.27	10.16
Mar	1990	113.2	114.2	128.7	129.5	13.80	14.04	13.34	10.17
Apr	1990	113.2	114.1	128.9	—	13.92	14.30	13.53	10.17
May	1990	113.5	114.6	129.2	—	13.96	14.16	13.46	10.22
June	1990	113.2	114.3	129.9	131.0	14.00	14.31	13.51	10.27
July	1990	113.4	114.5	130.4	—	14.29	14.49	13.58	10.34
Aug	1990	115.9	116.5	131.6	—	14.27	14.60	13.57	10.33
Sept	1990	118.4	118.4	132.7	132.2	14.41	14.48	13.62	10.42
Oct	1990	121.4	120.8	133.5	—	14.43	14.58	13.72	10.47
Nov	1990	120.7	120.1	133.8	—	14.34	14.73	13.73	10.53
Dec	1990	119.0	118.7	133.8	133.1	14.39	14.69	13.75	10.57
Jan	1991	119.3	119.0	134.6	—	14.73	14.63	13.85	10.60
Feb	1991	117.2	117.2	134.8	—	14.80	14.55	13.81	10.59
Mar	1991	115.6	116.1	135.0	134.8	14.93	14.55	13.85	10.55
Apr	1991	115.6	116.0	135.2	—	14.85	14.56	13.96	10.63
May	1991	116.1	116.5	135.6	—	14.79	14.52	14.01	10.66
June	1991	116.1 **R**	116.4 **R**	136.0	136.1	14.88	14.51	14.05	10.74
July	1991	116.0	116.0	136.2	—	15.09	14.56	14.16	10.77
Aug	1991	116.4	116.2	136.6	—	14.82 **R**	14.64 **R**	14.06 **R**	10.78
Sept	1991	116.2	116.0	137.2	136.9	15.06 **P**	14.60 **P**	14.22 **R**	10.85 **R**
Oct	1991	116.6	116.4	137.4	—	—.—	—.—	14.34 **P**	10.82 **P**

P = Preliminary **R** = Revised since last month

[1] US Bureau of Labor Statistics, Washington, DC: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents. Historical data is presented in Report 278.

[2] US Bureau of Labor Statistics, Washington, DC: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in Report 278.

[3] US Department of Commerce, Washington, DC: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted. Historical data is presented in Report 278.

[4] US Bureau of Labor Statistics, Washington, DC: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in Report 278.

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Volume and Price of Uranium Deliveries To The European Community[1]

— Compiled from data published by the Euratom Supply Agency —

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price		Spot Contracts[3] Average Price	
			in ECU per pound U_3O_8	in US Dollars per pound U_3O_8	in ECU per pound U_3O_8	in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19
1990	12,800	16.7	ECU 23.08	$29.39	ECU 7.60	$ 9.68

P = Preliminary **R** = Revised since last month

[1] The twelve European Community member nations are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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US Uranium Marketing Activities Statistics

— Compiled from data published by the US Energy Information Administration [1] —

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers [2] (million pounds U_3O_8)	Average Price of Delivered Uranium [2] (\$/lb. U_3O_8)	Quantity of Uranium Imported [3] (million pounds U_3O_8)	Average Price of Imported Uranium (\$/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	\$16.10	3.6	n/a	1.2
1977	29.9	27.8	\$19.75	5.6	n/a	4.0
1978	37.0	31.6	\$21.60	5.2	n/a	6.8
1979	37.5	33.0	\$23.85	3.0	n/a	6.2
1980	43.7	35.0	\$28.15	3.6	\$43.10	5.8
1981	38.5	32.6	\$34.65	6.6	\$32.90	4.4
1982	26.9	23.5	\$38.37	17.1	\$25.19	6.2
1983	21.2	24.2	\$38.21	8.2	\$26.16	3.3
1984	14.9	22.5	\$32.65	12.5	\$21.86	2.2
1985	11.3	21.7	\$31.43	11.7	\$20.08	5.3
1986	13.5	18.9	\$30.01	13.5	\$20.07	1.6
1987	13.0	20.8	\$27.37	15.1	\$19.14	1.0
1988	13.1	17.6	\$26.15	15.8	\$19.03	3.3
1989	13.8	18.4	\$19.56	13.1	\$16.75	2.1
1990	8.9	20.5	\$15.70	23.7	\$12.55	2.0

P = Preliminary **R** = Revised since last month

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity*.
1984-1990: Energy Information Administration, *Uranium Industry Annual*.

[2] Data for 1976-1981 includes both domestic utilities and agents.

[3] Includes imports by domestic utilities and domestic suppliers.

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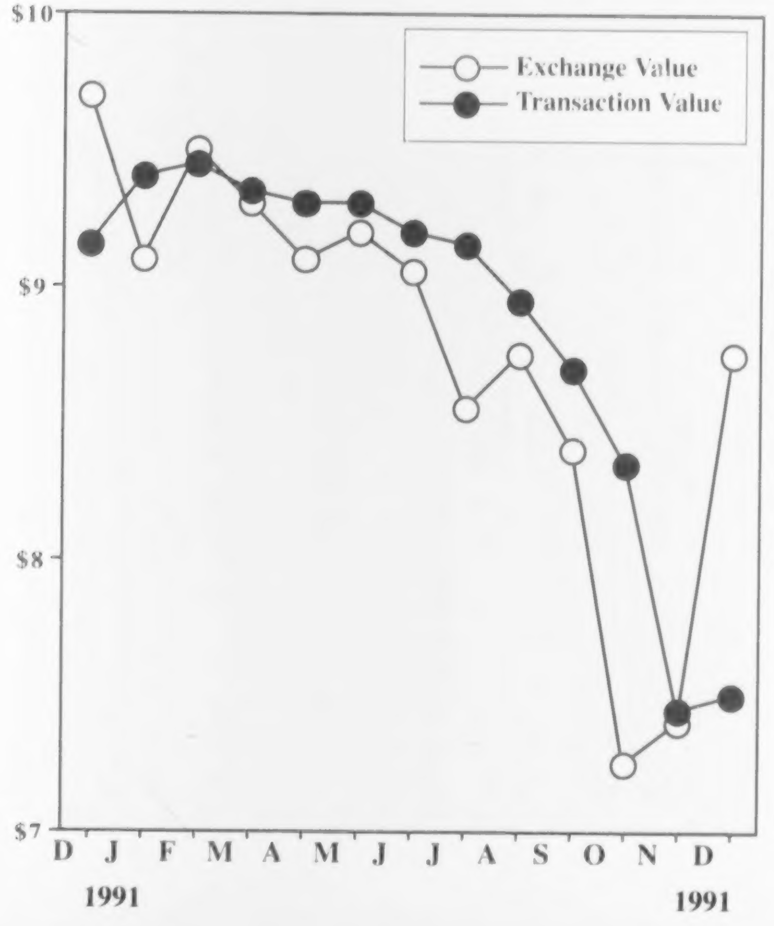

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To Our Readers

We are pleased to announce that James J. Graham is joining CONCORD/NUEXCO in Denver where he will work in a senior management role in several companies including NUEXCO, Energy Fuels, and CONCORD. Jim was formerly President and Chief Executive Officer of Total Minerals Corporation. He joined Total in 1984 as Executive Vice President of Total Energy Resources, Inc., the US holding company for TOTAL of France, and assumed his present position in 1988. He was also President and Chief Operating Officer of Malapai Resources Company, an indirect wholly owned subsidiary of Electricité de France. Prior to joining Total, he was President of General Exploration Company and earlier held senior positions with Zapata Corporation and Texasgulf, Inc.

Jim received his Bachelor of Science degree in Metallurgical and Mineral Engineering in 1970 from Michigan Technological University.

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MARKET REVIEW

Market Values Summary

NUEXCO Market Values	This Report December 31, 1991	Last Report November 30, 1991	12 Months Ago December 31, 1990
EXCHANGE VALUE [1]	**$8.75** / lb equivalent U_3O_8	$7.40	$9.70
UF_6 VALUE [2]	**$26.00** / kg U as UF_6	$22.75	$28.75
LOAN RATE [3]	**3.0%** / annum	3.5%	3.5%
CONVERSION VALUE [4]	**$1.55** / lb U as UF_6	$1.55	$1.45
SWU VALUE [5] **(0.3 w/o tails assay)**	**$70** / SWU	$68	$51
TRANSACTION VALUE [6]	**$7.50** / lb equivalent U_3O_8	$7.45	$9.15
Transactions	**26**	22	19
Months	**3**	3	3
Millions of Pounds	**8.0**	4.9	3.1

DEFINITIONS

[1] The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

[2] The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

[3] The **Loan Rate** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

[4] The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

[5] The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

[6] The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

a) Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;

b) At least ten transactions;

c) Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.
- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.
- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight-percent U^{235} and a product assay of 3.0 weight-percent U^{235}, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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DECEMBER MARKET REVIEW

(as of December 31, 1991)

OVERVIEW

Prices increased significantly in December, as the market continued the upturn that began late in November. A large increase in discretionary demand, coupled with more cautious sellers, led the Exchange Value to rise $1.35, to $8.75 per pound U_3O_8. The UF_6 Value also increased, climbing $3.25, to $26.00 per kgU as UF_6.

Market volume also increased in December, exceeding 3.7 million pounds equivalent U_3O_8 in eight near-term transactions. Seven longer term transactions also were reported, totalling over 13 million pounds equivalent U_3O_8 for delivery during 1992-2000. Four of these occurred in mid-1991.

The preliminary 1991 total spot and near-term sales volume now equals 30.4 million pounds equivalent U_3O_8 in 111 transactions (**Table 1**). This volume lags behind both 1989 and 1990 volume, but is still the third largest ever. The 1990 level of 40.1 million pounds remains the spot market volume record.

Few borrowers, many lenders, and lower overall interest rate structure finally forced the Loan Rate down one-half percentage point, to 3.0 percent per annum. No loans were reported from December.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	December 1991		Year-to-Date	
	No. of Sales	Volume[1]	No. of Sales	Volume[1]
Concentrates	5	0.8	78	18.8
Natural UF_6	2	2.7	20	7.6
EUP	1	0.2	13	4.0
Total[2]	**8**	**3.7**	**111**	**30.4**

[1] Million pounds equivalent U_3O_8
[2] Due to independent rounding, columns may not equal total.

The Conversion Value remained unchanged at $1.55 per pound U as UF_6. Two conversion transactions were reported: one near-term sale for a small quantity, and one intermediate-term sale to a utility for a large quantity of conversion services.

The SWU Value resumed its upward climb, and rose two dollars, to $70 per SWU. Only two enrichment sales were reported, both involving small quantities of SWU.

URANIUM AND CONVERSION

The record-low prices of late October and early November attracted numerous discretionary buyers into the market. This increase in demand, combined with more cautious sellers, led to rapidly rising prices in early December. But toward the end of the month, prices had risen to levels that led many potential buyers to reevaluate any purchase decisions. The **Exchange Value** ended December at **$8.75** per pound U_3O_8—a $1.35 increase from November 30.

Market activity declined late in the month as prospective buyers exited the market in reaction to rising prices. The higher prices near month-end caused at least three buyers seeking a total of almost three million pounds equivalent U_3O_8 to defer any purchases, causing the upward price pressure to subside. Thus, at year end, the future direction of the market was once again uncertain. The market continues to be characterized by abundant supply and limited demand, so near-term price movements will result largely from market participants' changing perceptions of and reactions to market events.

Although activity slowed in the latter half of December, market volume still totalled a healthy 3.7 million pounds equivalent U_3O_8 in eight near-term transactions. Five concentrates sales from intermediaries to producers and utilities were reported and totalled over 800 thousand pounds. The three remaining purchases, two by utilities, one by a producer, involved natural and enriched UF_6 and totalled over 2.9 million pounds equivalent U_3O_8.

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The UF_6 market was fairly active, as the large volume of UF_6 sold in December demonstrates. This market reflected the same conditions as the concentrates market, and the **UF_6 Value** rose $3.25, to **$26.00** per kgU as UF_6. This 14.3 percent increase is the third largest jump of the UF_6 Value since it was first published on April 30, 1985.

* * *

In the intermediate and long-term market, seven sales of concentrates and natural UF_6 were reported, totalling over 13 million pounds equivalent U_3O_8. Utilities made all seven purchases for delivery during the period 1992 through 2000, although four of the transactions occurred in mid-1991.

* * *

The **Transaction Value** edged up $0.05, to **$7.50** per pound U_3O_8 based on 26 transactions over three months involving 8.0 million pounds equivalent U_3O_8. Lower-priced sales from October and November prevented any large increases in the Transaction Value.

Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply[1]	Active Demand[1]
• Uranium (thousand lbs equivalent U_3O_8)	4,000	860
• Supply/Demand Ratio:	4.7	
• Loan (thousand lbs equivalent U_3O_8)	6,020	0
• Conversion (thousand lbs U as UF_6)	880	805
• SWU (thousand SWUs)	250	3

[1] Supply and Demand tables in the Market Review section of this Report provide details for each category.

* * *

Active uranium supply declined by over one million pounds from November 30, finishing December at **4.0** million pounds equivalent U_3O_8. While demand was quite high early in December, by month-end most discretionary buyers had concluded purchases or had withdrawn from the market in the face of higher prices. As a result, **active uranium demand** dropped over two million pounds, to **860** thousand pounds equivalent U_3O_8. Consequently, the **supply/demand ratio** rose to **4.7**.

* * *

The **Loan Rate** succumbed to the downward pressure of the past few months and declined to **3.0** percent per annum. This was the first change in the Loan Rate in over four years. Abundant loan supply, virtually no demand, and a very low interest rate structure in the USA all combined to push the Loan Rate down one-half percentage point. The three percent rate equals the Loan Rate's lowest level ever, which was last reached in July 1987. No loans were reported from December.

* * *

The **Conversion Value** remained unchanged at **$1.55** per pound U as UF_6. Two conversion transactions were reported: in one, a European utility purchased a small amount of conversion services for near-term delivery; in the other, a US utility purchased a large quantity for delivery in 1992 and 1993.

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ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

After remaining at $68 for two consecutive months, the **SWU Value** resumed its climb, and reached **$70** per SWU on December 31. Tighter SWU supply continues to push prices higher. Only two enrichment transactions were reported, both for small quantities of SWU sold to US utilities. One of the sales involved SWU contained in enriched uranium product (EUP). In a year when over 50 entities evaluated SWU offers sometime during the year, the enrichment market completed the year fairly quietly, with only three buyers evaluating near- and long-term SWU offers.

Table 3
ENRICHMENT PRICES
(December 31, 1991)

Prices	This Month Report 281	Last Month Report 280	12 Months Ago Report 269
NUEXCO SWU Value ($US per SWU)	70	68	51
US DOE SWU prices: ($US per SWU)			
USEC	121.50[1]	121.50[1]	117.85[2]
AFC	153.00[3]	153.00[3]	153.00[3]
Requirements	157.00[3]	157.00[3]	157.00[3]
Incentive Price (IP2)	104.67[4]	104.67[4]	100.68[5]
Calculated worth of enriched UF_6[6]**:** ($US per KgU as UF_6)			
2.0 w/o U^{235}	227	209	205
2.5 w/o U^{235}	318	295	282
3.0 w/o U^{235}	412	382	362
3.5 w/o U^{235}	508	472	444
4.0 w/o U^{235}	606	564	526
4.5 w/o U^{235}	705	656	609

[1] Effective 10/1/91.
[2] Effective 10/1/89 to 9/30/91.
[3] Effective since 10/1/84.
[4] Provisional IP2 for FY92: Effective 10/1/91 to 9/30/92, for up to 30% of annual requirements.
[5] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.
[6] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 w/o U^{235} tails assay.

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RECENT TRANSACTIONS

Uranium Sales [1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range [2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5308	1992	1,001-3,000	**R**	Producer	**R**	UF_6
5309	1992-1994	3,001-6,000	**R**	Utility	**R**	UF_6
5311	1992	Less Than 50	Below 90	Utility	Intermediary	
5313	1995-1999	601-1,000	See Remarks	Utility	Producer	Occurred earlier in 1991
5314	1995-1999	1,001-3,000	See Remarks	Utility	Producer	Occurred earlier in 1991
5315	1995-1999	1,001-3,000	See Remarks	Utility	Producer	Occurred earlier in 1991
5316	1994-2000	1,001-3,000	See Remarks	Utility	Producer	Occurred earlier in 1991
5318	1992-1993	101-300	Below 90	Utility	Intermediary	UF_6
5319	1991	101-300	Below 90	Producer	Intermediary	
5320	1992	101-300	90-97	Producer	Intermediary	
5324	1992	50-100	98-102	Producer	Intermediary	
5325	1992	101-300	Below 90	Utility	Intermediary	
5326	1992	101-300	90-97	Utility	Intermediary	UF_6
5327A	1992	101-300	See Remarks	Utility	Intermediary	Contained in EUP
5328	1993	301-600	103-110	Utility	Intermediary	UF_6

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Exchange Value or UF_6 Value. The endpoints of each range are included within that range.

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MARKET REVIEW

RECENT TRANSACTIONS

Natural Uranium Loans[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U3O8)	Price Within Percentage Range[2] of Current Loan Rate	Borrower	Lender	Remarks
No loans of natural uranium are reported						

Conversion Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range[2] of Current Conversion Value	Buyer	Seller	Remarks
5307	1992	50-100	**R**	Utility	**R**	
5321	1992-93	1,001-3,000	See Remarks	Utility	Converter	Series of Fixed Prices

Enrichment Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity[3] (thousand SWU)	Price Within Percentage Range[2] of Current SWU Value[4]	Buyer	Seller	Remarks
5323	1992	Less Than 50	98-102	Utility	Intermediary	
5327B	1992	Less Than 50	See Remarks	Utility	Intermediary	Contained in EUP

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[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., X dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

Uranium Supply

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Quantity (Thousand Pounds equivalent U_3O_8) Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE TO PURCHASE:				
ACTIVE				
91-1292*	300	—	1992	
91-1502	500	—	1992	
91-1505*	500	—	1992	
91-1506	500	—	1992	
91-1507	500	—	1992	
91-1511	260	—	1992	UF_6
91-1512	785	—	1992	UF_6
91-1241	655	650 per year	1992-1996	
91-1268	—	1,000 per year	1992-2001	
TOTAL	**4,000**			
INACTIVE	**4,430**			
AVAILABLE TO LOAN:				
ACTIVE				
90-1057A	310	—	—	UF_6
91-1084	3,900	—	—	U_3O_8
91-1174	1,000	—	—	U_3O_8
91-1219	260	—	—	U_3O_8
91-1220	325	—	—	UF_6
91-1260	225	—	—	U_3O_8/UF_6
TOTAL	**6,020**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 90-1307, 91-1503A

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SUPPLY AND DEMAND

Uranium Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8)		Delivery Period	Remarks
	Spot or Near-term[1]	Intermediate or Long-term[2]		
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1272*	500	—	1992	
91-1293A*	10	—	1992	UF_6e
91-1297*	150	—	1992	
91-1516*	200	—	1992	
91-1118	—	300 per year	1993-1998	U_3O_8/UF_6
91-1184	—	350 per year	1993-1997	
91-1290*	—	310 per year	1995-1999	U_3O_8/UF_6
91-1294*	—	250 per year	1996-2000	
91-1197	—	2,210	1992-1997	U_3O_8/UF_6
91-1227A	—	60	1992-1994	UF_6e
91-1245	—	1,000	1993-1997	
91-1283*	—	5,225	1994-2000	U_3O_8/UF_6
TOTAL	**860**			
INACTIVE	**1,750**			

INQUIRIES TO BORROW: *No inquiries to borrow are reported*

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* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: 91-1234, 91-1235, 91-1255, 91-1259, 91-1263, 91-1271, 91-1277

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SUPPLY AND DEMAND

Conversion Supply and Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF_6) Within 3 Years[1]	Beyond 3 Years[1]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1500	440	—	1992	
91-1501	440	—	1992	
TOTAL	**880**			
INACTIVE	*None reported*			
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1275	620	—	1992	
91-1301*	185	—	1992	
91-1299*	—	330	1993-1997	
TOTAL	**805**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 91-1264

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SUPPLY AND DEMAND

SWU Supply And Demand

NUEXCO Project Number	Quantity (Thousand SWUs) Spot or Near-term[1]	Quantity (Thousand SWUs) Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1515*	50	—	1992	
91-1509	200	—	1992	
TOTAL	**250**			
INACTIVE	**785**			
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1293B*	3	—	1992	UF$_6$e
90-1196	—	60 per year	1995 on	
91-1142	—	75 per year	1995-2000	
91-1152	—	2,700	1995-2001	
91-1171	—	560	1995-1998	
91-1227B	—	35	1992-1994	UF$_6$e
91-1232	—	400	1993-1994	
91-1250	—	45	1993	UF$_6$e
TOTAL	**3**			
INACTIVE	**215**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 90-1078D, 91-1066

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Exchange Value[1]

Country (currency)	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
	This Month (Dec 31, 1991)	Last Month (Nov 30, 1991)	12 Months Ago (Dec 31, 1990)	This Month (Dec 31, 1991)	Last Month (Nov 30, 1991)	12 Months Ago (Dec 31, 1990)
Australia (dollar)	11.51	9.43	12.58	29.93	24.52	32.71
Belgium (franc)	273.69	247.33	299.57	711.54	642.99	778.81
Canada (dollar)	10.11	8.40	11.25	26.29	21.83	29.25
EC (ecu)	6.53	5.92	7.17	16.96	15.40	18.64
Finland (markka)	36.15	32.49	35.13	93.97	84.46	91.34
France (franc)	45.33	41.03	49.32	117.84	106.67	128.23
Germany (mark)	13.26	12.02	14.50	34.46	31.26	37.70
Italy (lira)	10,040	9,052	10,922	26,102	23,533	28,395
Japan (yen)	1,092	960.91	1,309	2,839	2,498	3,402
Netherlands (guilder)	14.94	13.55	16.35	38.83	35.23	42.50
So. Africa (comm. rand)	23.99	20.72	24.88	62.36	53.87	64.68
So. Korea (won)	6,639	5,579	6,931	17,260	14,505	18,018
Spain (peseta)	845.08	764.78	927.79	2,197	1,988	2,412
Sweden (krona)	48.42	44.02	54.56	125.89	114.45	141.83
Switzerland (franc)	11.87	10.61	12.38	30.86	27.59	32.18
Taiwan (dollar)	223.12	190.62	258.36	580.07	495.58	671.69
UK (pound)	4.68	4.19	5.04	12.17	10.88	13.10
US (dollar)	8.75	7.40	9.70	22.75	19.24	25.22

Transaction Value[1]

Country (currency)	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
	This Month (Dec 31, 1991)	Last Month (Nov 30, 1991)	12 Months Ago (Dec 31, 1990)	This Month (Dec 31, 1991)	Last Month (Nov 30, 1991)	12 Months Ago (Dec 31, 1990)
Australia (dollar)	9.87	9.50	11.87	25.66	24.69	30.85
Belgium (franc)	234.59	249.00	282.58	609.89	647.34	734.65
Canada (dollar)	8.67	8.45	10.61	22.53	21.98	27.59
EC (ecu)	5.59	5.96	6.76	14.54	15.50	17.59
Finland (markka)	30.98	32.71	33.14	80.55	85.03	86.16
France (franc)	38.85	41.31	46.53	101.00	107.39	120.96
Germany (mark)	11.36	12.11	13.68	29.54	31.47	35.56
Italy (lira)	8,606	9,113	10,303	22,373	23,692	26,785
Japan (yen)	935.98	967.41	1,234	2,433	2,515	3,209
Netherlands (guilder)	12.80	13.64	15.42	33.28	35.47	40.09
So. Africa (comm. rand)	20.56	20.86	23.47	53.45	54.24	61.01
So. Korea (won)	5,690	5,617	6,538	14,794	14,603	16,996
Spain (peseta)	724.36	769.95	875.18	1,883	2,002	2,275
Sweden (krona)	41.51	44.32	51.46	107.90	115.22	133.79
Switzerland (franc)	10.17	10.68	11.68	26.45	27.77	30.35
Taiwan (dollar)	191.25	191.91	243.71	497.20	498.93	633.60
UK (pound)	4.01	4.21	4.75	10.43	10.96	12.35
US (dollar)	7.50	7.45	9.15	19.50	19.37	23.79

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[1] As of May 1991 Report #273; calculated using currency exchange rates **for** the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273; calculated using currency exchange rates published in *The Wall Street Journal* **on** the last business day of the month.

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Conversion Value[1]

Country (currency)	per lb U as UF_6			per kg U as UF_6		
	This Month (Dec 31, 1991)	Last Month (Nov 30, 1991)	12 Months Ago (Dec 31, 1990)	This Month (Dec 31, 1991)	Last Month (Nov 30, 1991)	12 Months Ago (Dec 31, 1990)
Australia (dollar)	2.04	1.98	1.88	4.50	4.36	4.15
Belgium (franc)	48.48	51.80	44.78	106.89	114.21	98.72
Canada (dollar)	1.79	1.76	1.68	3.95	3.88	3.71
EC (ecu)	1.16	1.24	1.07	2.55	2.73	2.36
Finland (markka)	6.40	6.80	5.25	14.12	15.00	11.58
France (franc)	8.03	8.59	7.37	17.70	18.95	16.25
Germany (mark)	2.35	2.52	2.17	5.18	5.55	4.78
Italy (lira)	1,779	1,896	1,633	3,921	4,180	3,599
Japan (yen)	193.44	201.27	195.60	426.45	443.73	431.23
Netherlands (guilder)	2.65	2.84	2.44	5.83	6.26	5.39
So. Africa (comm. rand)	4.25	4.34	3.72	9.37	9.57	8.20
So. Korea (won)	1,176	1,169	1,036	2,593	2,576	2,284
Spain (peseta)	149.70	160.19	138.69	330.03	353.16	305.76
Sweden (krona)	8.58	9.22	8.16	18.91	20.33	17.98
Switzerland (franc)	2.10	2.22	1.85	4.64	4.90	4.08
Taiwan (dollar)	39.52	39.93	38.62	87.14	88.03	85.15
UK (pound)	0.83	0.88	0.75	1.83	1.93	1.66
US (dollar)	1.55	1.55	1.45	3.42	3.42	3.20

SWU Value And UF_6 Value[1]

Country (currency)	SWU Value at 0.30 w/o Tails Assay			UF_6 Value per kg U as UF_6		
	This Month (Dec 31, 1991)	Last Month (Nov 30, 1991)	12 Months Ago (Dec 31, 1990)	This Month (Dec 31, 1991)	Last Month (Nov 30, 1991)	12 Months Ago (Dec 31, 1990)
Australia (dollar)	92.11	86.68	66.15	34.21	29.00	37.29
Belgium (franc)	2,190	2,273	1,575	813.26	760.36	887.89
Canada (dollar)	80.89	77.16	59.16	30.04	25.81	33.35
EC (ecu)	52.20	54.52	37.71	19.39	18.21	21.26
Finland (markka)	289.17	298.52	184.72	107.41	99.87	104.13
France (franc)	362.60	377.02	259.33	134.68	126.14	146.19
Germany (mark)	106.04	110.50	76.24	39.39	36.97	42.98
Italy (lira)	80,321	83,180	57,426	29,834	27,829	32,372
Japan (yen)	8,736	8,830	6,880	3,245	2,954	3,878
Netherlands (guilder)	119.49	124.52	85.96	44.38	41.66	48.46
So. Africa (comm. rand)	191.89	190.42	130.80	71.27	63.71	73.74
So. Korea (won)	53,111	51,270	36,439	19,727	17,153	20,542
Spain (peseta)	6,761	7,028	4,878	2,511	2,351	2,750
Sweden (krona)	387.38	404.52	286.84	143.88	135.34	161.70
Switzerland (franc)	94.95	97.51	65.08	35.27	32.62	36.68
Taiwan (dollar)	1,785	1,752	1,358	662.99	586.04	765.77
UK (pound)	37.44	38.47	26.49	13.91	12.87	14.93
US (dollar)	70.00	68.00	51.00	26.00	22.75	28.75

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[1] As of May 1991 Report #273; calculated using currency exchange rates **for** the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273; calculated using currency exchange rates published in *The Wall Street Journal* **on** the last business day of the month.

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RECENT DEVELOPMENTS

China

USTR Action Regarding Chinese Uranium

Due to concerns over intellectual property laws, policies, and practices of the People's Republic of China, the United States Trade Representative (USTR) announced this past November that it was considering action against selected Chinese products under section 301 of the Trade Act of 1974. As a result, there was a possibility that natural uranium concentrates of Chinese origin would have been subject to US import tariffs.

At the time of the initial USTR action, a list of items was published and made available for public review and comment for a thirty-day period ending January 2, 1992. The products included on the extensive list varied from textiles to nuts and bolts. Natural uranium also was included on this initial list. The fact that the items were listed did not imply that there was anything illegal regarding the product. The list was just an enumeration of products imported to the USA from China that could have been selected as a target of tariffs aimed at chastising China for inadequate protection of copyright, patent, and other intellectual property rights.

High-level negotiations were underway between the USTR and the Chinese government to try to resolve the situation and avoid the imposition of duties. While the USTR had until nearly the end of February to make a final decision, it set a deadline for settlement of January 16, 1992. Talks reconvened on January 10, 1992, and after intense negotiations, a settlement on protection of intellectual property was reached. As a result, no final list was published and Chinese uranium will not be subject to US import tariffs.

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INDUSTRY BRIEFS

Ontario Hydro Revises Long-Term Plan

In response to the policies of Ontario's ruling New Democratic Party, Ontario Hydro announced in mid-December that it was dramatically revising it 25-year electric demand and supply plan. The revised plan will forego construction of any new generating plants in the foreseeable future, and instead, will rely upon non-utility generation and demand-side management to meet reduced forecast load growth. This new plan appears to scrap the original expansion program calling for ten new 880-MWe CANDU reactors by 2014.

◆ ◆ ◆

Pakistan Signs Agreement with China for 300-MWe Plant

The Pakistan Atomic Energy Commission announced in Bejing, China, on December 31, that it had signed an agreement to purchase a nuclear power plant from China. A tentative agreement for the reactor purchase was first reached in 1989. The 300-MW plant will be located at Chasma and is scheduled for operation by 1998. Officials stressed that the plant will be subject to IAEA safeguards.

Several Countries Sign Pacts

On December 13 in Vienna, Argentina's president Carlos Menem and Brazil's president Fernando Collor de Mello signed draft safeguards agreements confirming their announced intention not to develop nuclear weapons. The new agreement is viewed as a tremendous boost to the International Atomic Energy Agency's (IAEA) safeguards efforts. The agreement also is compatible with the Tlatelolco Treaty, the Latin America non-proliferation treaty.

In another positive step toward improved nuclear cooperation, India and Pakistan exchanged lists of nuclear facilities as part of a 1988 agreement that the two countries ratified in 1991.

North Korea also made a positive step toward easing world proliferation concerns, confirming on January 7 that it intends to sign an IAEA safeguards agreement by the end of January. The country signed the NPT six years ago, but has not put safeguards agreements in place and has continued to operate several non-safeguarded nuclear facilities.

Chinese and Indian Nuclear Plants Generate First Electricity

On December 15, China's domestically designed and constructed nuclear power plant at Qinshan (300-MWe PWR) achieved criticality. The plant marked this achievement about one year behind its original schedule. Qinshan is China's first nuclear reactor and is expected to reach commercial operation early this year.

In other reactor developments, India announced that its eighth nuclear reactor, Narora 2 (220-MWe PHWR), reached criticality in late 1991, and was expected to reach commercial operation in early 1992.

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Armenia Plans to Restart Nuclear Plant

The independent republic of Armenia (part of the commonwealth of former Soviet republics) has announced that it plans to restart the Armenia nuclear power station near Erevan to help alleviate a serious energy supply shortage. The station, containing two VVER-440s (model 230), was shut down in 1989 due to public opposition and safety concerns. The decommissioning plans have been suspended and the republic hopes to have Unit 2 at the station operating by the end of 1992.

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Germany to Close its Sole Nuclear Waste Site

Germany's only nuclear waste storage facility at Morsleben will be closed following a decision by the Magdeburg District court. The basis of the court decision was that the facility was being operated under a permit issued by the government of the former East Germany. The court ruled that this permit was not automatically valid in unified Germany, despite the Treaty of Unification that granted the facility a ten-year license as of July 1, 1990.

◆ ◆ ◆

Hungary's MVMT Becomes Public Limited Holding Company

As of January 1, 1992, Hungary's state electric utility, Magyar Villamos Muvek Troszt (MVMT), became a public limited company, with the eventual goal of becoming a state-owned production and transmission company, with six private distribution companies.

MVMT also decided recently not to send spent fuel from its Paks nuclear power station to the former Soviet Union for disposal. Although an agreement signed in February 1991 allowed for the return of spent fuel, Hungary has elected not to exercise that option and instead has decided to develop some interim storage facilities domestically. The high costs of returning the spent fuel and a desire for more independence in fuel cycle services led to the decision.

Canada to Remove Upgrading Requirements on Uranium

On December 13, Jake Epp, the Canadian Minister of Energy, Mines and Resources announced the government will be phasing out Canada's uranium upgrading policy. Similar to his announcement in 1990 interpreting the policy in light of the US-Canada Free-Trade Agreement, the new policy states that all new uranium sales contracts reviewed by the federal government after December 15, 1991, will not be subject to further processing requirements. Contracts signed before that date will still be subject to the policy, but contracted deliveries after December 31, 1995, will not be required to meet the policy, regardless of when the original contract was signed.

◆ ◆ ◆

KEPCO Requests AECL Bid for Wolsong Units

Korea Electric Power Corporation has requested a bid from AECL CANDU (a subsidiary of Atomic Energy of Canada, Ltd.) to provide the nuclear steam supply systems for Units 3 and 4 at KEPCO's Wolsong station. If AECL is awarded the contract, it would become the sole supplier for the station composed of four 629-MWe (net) CANDU reactors. The company built Wolsong 1 in only 61 months and within budget, and also is supplying Unit 2, currently under construction.

Nuclear Electric Permitted to Operate MAGNOX Reactors until 1995

The United Kingdom's Nuclear Installations Inspectorate has given Nuclear Electric approval to operate the MAGNOX reactors at Bradwell, Dungeness, Hinkley Point, and Sizewell to the end of their 30-year lifetimes in 1995. The reactors were given permission earlier in 1991 to operate only through the end of the year until satisfactory results were obtained from reactor vessel embrittlement tests at Trawsfynydd. The continued operation is contingent upon increased monitoring of the pressure vessel welds, and more restrictive start-up conditions.

◆ ◆ ◆

European Energy Charter Signed

December 17, 1991, marked the beginning of the European Energy Charter, as 48 parties signed the new agreement. After almost a year and a half of negotiation, the pact finally was concluded. It calls for increasing safety at Soviet-built nuclear stations, improving interconnections of power grids throughout Europe and western Asia, and boosting commercialization of oil and natural gas reserves in the former Soviet Union and eastern Europe. Signatories included 31 European states, 12 former Soviet republics, the independent Baltic state of Latvia, as well as Canada, Japan, Australia, and the USA.

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US NATIONAL ENERGY STRATEGY: PROGRESS AND VIEWPOINT

The following essay was prepared by J. Robert Wolcott, Chairman of CONCORD's International Advisory Committee and former Chairman and President of NUEXCO. Mr. Wolcott comments on recent actions by the US Administration and Congress to legislate a national energy strategy.

Interest in energy policy is not new. President Eisenhower grappled with oil policy. President Nixon pushed "energy independence". President Carter attempted the formulation of a comprehensive policy. All failed in one way or another.

Efforts to define comprehensive national policy continue. Two years ago President Bush directed the Department of Energy to prepare a "National Energy Strategy". An energy package was sent to Congress in 1991, but despite compromises among competing interests, the end result was that not enough votes could be garnered to pass the legislation. Another attempt is expected in 1992.

A major problem with the previous bill was that in attempting to be "comprehensive", too many controversial issues were wrapped into a single package. The next attempt is likely to be divided into several bills; some may pass, others may not. Topics that received the most attention in the 1991 session are expected to get equal scrutiny in 1992. These topics include:

- Mandated automobile gasoline mileage standards—raising required corporate average fuel economy (CAFE) from 27 to 40 miles per gallon.
- Oil exploration in Alaska's Arctic National Wildlife Refuge.
- Simplified licensing of nuclear power plants.
- Increased competition in electrical power production.
- Increase of conservation and renewables development funding beyond the Administration's proposed level.

The emotional drive behind environmental forces is very strong—so strong, in fact, that public policy is being made in advance of, or without, supporting scientific information.

Concern about the environment, adequate supply of electrical power, and production and conservation of petroleum is the driving force behind consideration of these topics and the major underlying influence shaping debate over energy policy.

ENVIRONMENTAL PROTECTION

Of these three major considerations, environmental protection is foremost. The issues of clean air, acid rain, ozone depletion, and global warming dominate the environmental agenda. Whether production facilities will be built, where they will be built, what technology will be used, and what performance will be specified, are all highly influenced by environmental considerations. Likewise automobile technology, size, design, styling (aerodynamics), mileage, and gasoline composition are similarly influenced.

The emotional drive behind environmental forces is very strong—so strong, in fact, that public policy is being made in advance of, or without, supporting scientific information. For example, a $500-million, multi-year, federally funded study by the National Academy of Sciences concluded that acid rain damage was less severe than previously thought, and that many inexpensive solutions were feasible. Yet without waiting for the final report or without apparently using its findings, the Congress and President Bush approved the Clean Air Act estimated to cost the USA $40 billion per year.

Some argue that merely envisioning global warming as a possibility is sufficient justification for drastic action. Environmentalists are pressing for cutbacks in carbon dioxide emissions even though the validity of the scientific data remains controversial and the potential cost of corrective measures is enormous. A recent Department

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of Energy report concluded that reducing carbon dioxide emissions to levels targeted by European countries would cost the United States $95 billion per year, double the price of gasoline, and increase the wellhead cost of natural gas by 400 percent—and all this while scientists are uncertain whether, how much, and why, the earth is warming.

ELECTRICAL ENERGY DEMAND

The whole foundation of Western society is based on electrical energy. Economic and employment losses from insufficient electrical energy supply would lead to intolerable social and political consequences. The costs of a capacity surplus are negligible compared to the costs of a ten-percent shortage. Excess capacity lasts only a few years with growing demand, while even a small capacity shortage may require 10 to 15 years to overcome.

Electrical demand continues to increase at 3 percent to 4 percent per year. Even during the first half of 1991, while in a recession, growth was 2.2 percent. Forecasts project growth rates to continue at that level and could be higher. More electrical products, such as the electric automobile, are on the horizon. (California, nine Northeastern States, and the District of Columbia, have already mandated some electric automobile sales in the latter part of the 1990s).

> ***Kuwait can locate, develop, produce, and ship oil for less than $2 per barrel...in the United States it costs more than $10 per barrel...Average US production per well is only 15 barrels per day, compared to 1,500 for Kuwait and 6,000 for Saudi Arabia.***

PETROLEUM: SUPPLY, NATIONAL SECURITY, AND CONSERVATION

Oil supplies 40 percent of the United States' total energy. Of that, transportation accounts for 64 percent; industry, 25 percent; residential and commercial, eight percent; and utilities, three percent. Today, one quarter of US production comes from Alaska's Prudhoe Bay, which may continue to produce for only another decade or two. The United States was the world's largest oil producer and exporter until after World War II. Now the country is the world's foremost oil consumer, a secondary producer, and a major importer. Nearly half the 17 million barrels per day used by the United States is imported.

High production costs limit United States production. Kuwait can locate, develop, produce, and ship oil for less than $2 per barrel. Merely finding and developing oil reserves in the United States costs more than $10 per barrel. As a result, domestic production is gradually declining: production declined by nearly 700,000 barrels per day in one recent year. Additionally, the US has no high-volume wells. Average US production per well is only 15 barrels per day, compared to 1,500 for Kuwait and 6,000 for Saudi Arabia.

Nearly all of the large reserves are foreign. The Yates Field in Texas, once among the world's largest, now has reserves of only 900 million barrels. Saudi Arabia's Ghawar Field, alone, contains reserves of 83 billion barrels—almost 100 times the Yates Field. Kuwait's Burgan Field contains reserves of 72 billion barrels. Iraq's reserves, alone, are three times those of the United States. Moreover, promising areas for new discoveries are largely confined to Alaska and to off-shore areas where development is costly and uncertain.

Conventional wisdom believes that the less oil imported, the stronger the national security. But, conventional wisdom does not extend to agreement on measures for reducing that dependency, as the controversy over the exploration of Alaska's Arctic National Wildlife Refuge (ANWR) illustrates. Environmentalists argue that maintaining a pristine environment must take priority and that demand should be satisfied through conservation. Industry argues that conservation will be only a partial solution at best. Further, it advocates exploration on the basis that ANWR may contain the largest reserves in North America, can be developed without environmental damage, and will involve only a small portion of the Refuge. Congress, to date, has supported the environmentalists position.

Many petroleum controversies center on national energy security—an issue that is not new. In 1955, Congress gave President Eisenhower authority to control oil imports

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whenever the "nation's security or its economic well being was threatened". He chose not to use that power, but rather, he suggested purchasing and storing low-cost foreign oil in abandoned wells. To deal with national security concerns, the government now has stored approximately 580 million barrels of crude oil in underground caves; however, at present consumption levels, this amount is adequate to replace imports for less than three months.

In the late 1950s, Clarence Randall, then Chairman of the Council on Foreign Economic Policy, proposed that "Our policy should be to conserve that which we have, rather than to take measures which would cause our supplies to be exhausted more rapidly." In other words, use imports in the short term to build long-term security. Clarence Randall's philosophy still remains largely unresolved.

"Our policy should be to conserve that which we have, rather than to take measures which would cause our supplies to be exhausted more rapidly."— Clarence Randall

What are the implications of this oil situation on future US policy? We know with reasonable certainty that:

- Oil reserves are finite. The more domestic oil that is used in the near term, the less that will be available in the long term.
- Foreign sources have, and will continue to have, lower production costs. Maintaining a high level of domestic production in competition with low-cost foreign sources would require subsidies, protectionism, and high prices.
- Meeting United States environmental requirements is already more costly than in other oil-producing nations. The outlook is for higher costs, as the Environmental Protection Agency continues to take on an expansive character similar to that of the Nuclear Regulatory Commission.
- Domestic oil development is slow, costly, and uncertain. Overseas investment is increasingly attractive.
- Oil imports have already passed the point of no return. If there were a drastic reduction of oil imports the economy could not withstand the shock, even if the import percentage were substantially lower than it already is.
- Conservation may decrease oil consumption, thereby reducing the demand for new capacity. But realistically, it will not significantly affect the course of increasing import dependency.

In sum, limited production capability, high production costs, limited reserves, complex environmental issues, investors' choices, and conservation's practical limitations, make the increased use of imported oil a certainty. The real challenge is to be realistic—to concentrate on what we can do, and not on what we wish we could do. France, Germany, Japan, and other oil-dependent nations have learned to cope. The United States has no choice but to do likewise.

LICENSING AND THE FUTURE OF NUCLEAR POWER

Nuclear power provides nearly 21 percent of the United States' electrical power, but the industry is stalemated. A new plant has not been ordered for 15 years and a renewal of orders is not expected for another decade. Recently, however, new design concepts, environmental advantages, and a lack of alternatives has heightened interest in preserving the nuclear option.

Government action has focused on simplified licensing which is, vitally important. But, licensing is only one aspect of a complex problem. Other obstacles include: nuclear waste, siting, safety, investor confidence, and community acceptance. Without solutions to these, nuclear power will remain in the doldrums; an improved, but inactive, licensing process will be the result.

No practical alternative to nuclear power is available. Paul Tsongas, a former Massachusetts senator and a current Democratic presidential candidate, recently wrote:

> When I was struggling with the issue of nuclear power as a Congressman and Senator in the 1970s, there was furious debate among my staff members and outside advisors. The split saw my strong

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> environmental supporters aligned with my political advisors. The argument was clear. Environmentalists were fiercely anti-nuclear. They were my most dedicated loyalists. And, they had valid concerns that were always being casually dismissed by utilities and governments alike. Being anti-nuclear would be substantively correct and politically beneficial.
>
> On the other side was my energy staff person. He was not unsympathetic to the logic arrayed against him. He thought the nuclear industry and the utilities had been mindless, stubborn and reactionary. He thought that they had become their own worst enemy for good reason.
>
> 'But,' he asked, 'if you eliminate nuclear, what do you put in its stead? What exactly is the replacement process for shutting down the nuclear option? Tell me specifically, what substitutes for what?'
>
> At first we provided the expected response about conservation and renewables option. But, when we tried to put numbers on them, there was a huge gap, no matter how aggressively we pushed these options.
>
> That left oil, gas and coal. All were finite and oil and coal had particular problems if you overloaded the system with them. While gas would be a clean energy source it would not substitute for everything else. In the end, there were no open doors left except nuclear.
>
> Accepting this was excruciating. Politically, it was all downside. It remains the most difficult and uncomfortable policy position I have ever taken. But today, more than a decade later, my position is unchanged.

In order for nuclear power to return, investors must be convinced standardization is real, performance claims associated with new concepts are achievable, and simplified licensing has proven workable. That requires construction and testing of plant prototypes. Before volume production is undertaken for any product line (for example, airplanes) prototypes test the concepts so that deficiencies can be corrected at minimum cost. Nuclear power plants require the same process; without prototypes, past mistakes will be repeated.

After the year 2000, the nuclear industry has a high probability of once again growing provided standardized models have been built and tested to form a solid foundation. The United States has a "window of opportunity" of approximately ten years. How and whether that "window" will be utilized is vital to the future of nuclear energy in this country.

CONSERVATION

Conservation is the most praised, most calculated, most ideological, most optimistic, and—with the possible exception of solar—the most popular alternative energy approach.

We do not know how much conservation has or will contribute. Accurately determining the savings due to conservation is difficult, as measuring how much energy we did not use and why is more subjective than objective. Moreover, savings may be exaggerated by regulatory agencies, such as the California Energy Commission, who can be biased by their own commitment to "success".

The forces currently driving conservation efforts include, for different reasons, ethics (opposition to waste), economics, ideology, environmentalism, opposition to growth, societal reshaping, political expediency, and business profit. The coalition of these interests has been very influential. But coalitions survive only when each member's gains from collective action exceed those obtainable individually. As time goes on, some interests will go their separate ways as ideology, economics, and quality of life conflict.

Regulators and utility managers have wisely turned conservation into an attractive business. Utilities currently spend over $2 billion per year on conservation in support of numerous programs, including free fluorescent lights, government-mandated energy efficiency standards, subsidies for exceeding standards, demand side management, and least-cost approaches. The utilities' conservation business is easily developed; the marketing is not difficult; and pricing and collections are simple, as well. Utilities are allowed to recover the costs of such programs, and make profits, much the same as they would for financing, building, and operating facilities.

Reductions in the annual growth rate of electrical power due to conservation have been estimated as high as four percent.

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That seems high, for when added to actual growth of four percent per year, it indicates total growth without conservation would have been eight percent. Such a rate has not been achieved for decades. More realistic estimates suggest a ten percent reduction in growth rate over the next decade. This is equivalent to saving one years' expansion in a decade—or equivalent to avoiding construction of twenty to thirty new generating plants. While this "avoidance" is significant, one must not lose sight of the fact that 180 to 270 new plants will still be needed in the remaining nine-year equivalent.

Petroleum savings due to conservation also are difficult to estimate. Gasoline prices, mandated automobile mileage standards, substitution of electrical energy (as in home heating), and many other variables all have an impact. Separating the influence of any one is not feasible.

SOLAR ENERGY: An Oversold Technology

The use of solar technology continues to improve for localized applications such as heating homes and swimming pools, and powering remote communication equipment. But solar's contribution to total energy generation is very small. Central generating stations are, and will remain, the major source of electrical power. Solar must demonstrate that it has practical applications in large, central stations if it is to make a significant contribution. That is unlikely. Nature, not technology, sets the limits. Peak sunshine is only four to eight hours, and every day is not sunny. Further, energy needs are greatest in the winter when the weather is poorest.

Storage systems (such as batteries or pumped hydro storage) can be used to compensate for conditions unsuitable for solar generation. However, the capacity of a solar generation system must then be large enough to meet current demand and charge the storage system simultaneously. This increased peak-load requirement means generating capacity must be two to three times that of a conventional plant. In addition, to compensate for losses in storage efficiency, approximately four units of energy must be generated for each three units supplied to the grid for storage. The combination of unpredictable weather, nighttime, and efficiency losses suggest 3,000 to 4,000 MWe of peak generation capacity, plus storage facilities, will be required to provide service equivalent to a 1,000 MWe conventional plant.

If a conventional plant of comparable size is required as a backup and can be justified economically, why add the solar investment?

Another alternative to assure continuity of service is a backup conventional plant of equal size. That is difficult to justify economically. If a conventional plant of comparable size is required, why add the solar investment?

Solar facilities are expensive and complex. Dixy Lee Ray, a prominent scientist, former University of Washington professor, former Chair of the Atomic Energy Commission, and former governor of the State of Washington, has this to say about a solar plant:

> To construct a 1,000 megawatt solar plant, the following amounts of material are needed: 35,000 tons of aluminum, two million tons of concrete (500 times more than for a nuclear plant), 7,500 tons of copper, 600,000 tons of steel, 75,000 tons of glass, and 1,500 tons of chromium and titanium.
>
> Whichever method is adopted, solar heat or photovoltaic, a large area of land is needed—about 50 square miles for a 1,000 megawatt plant. Compare this to 75 to 150 acres for a 1,000 megawatt nuclear or coal plant.

WIND ENERGY: Another Oversold Resource

Technical advancements particularly in variable-speed turbines, have resulted in some progress in wind energy. Nonetheless, like solar, wind is limited by nature and has been oversold to the public, thus presenting a special public relations problem.

As an example, Sweden oversold the potential renewable energy sources and is now confronted with the task of public backtracking. Over time, government policies gradually ruled out increased use of fossil fuels, new hydro power, and nuclear power. The new Swedish policies stressed reliance on conservation and renewables. The practical consequences of these policies were not evident until recently, since Sweden formerly had excess generating capacity.

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Difficult decisions had to be made following the government's proposal to close two of Sweden's twelve nuclear plants by the mid-1990s. This first step toward eliminating nuclear power raised real questions. Was the power from the two plants needed? (Answer: Yes) What should the replacement be? (Answer: Undetermined) Could conservation and renewables fill the need? (Answer: No) Should the previous decision be reversed and the two nuclear plants kept in operation? (Answer: Yes)

The previously established policy collapsed—as industry, labor, and many others expected. The two nuclear plants would continue to operate, and energy policy would be reexamined. It is no longer expected that the nuclear plants will be shutdown before the end of their useful life.

> ***A windmill demonstration program much like the earlier one remains under discussion, but...the purpose now is to demonstrate to the public the limitations of windmills, rather than their potential.***

Since wind energy had been prominently touted in Sweden as an alternative energy source, a major demonstration program for public education had been planned. However, this plan was reevaluated when a conservative government replaced the liberal government. A windmill demonstration program much like the earlier one remains under discussion, but with different priorities. The purpose now is to demonstrate to the public the limitations of windmills, rather than their potential.

COMPETITION IN ELECTRICAL POWER PRODUCTION

Perspectives on regulation of utilities has changed with time. Once considered comprehensive monopolies by necessity, a utility's scope included everything from generation to consumer distribution. Now the industry's components are examined, and each is recognized as having different competitive potential necessitating specific regulatory requirements. The four major components are: power generation and delivery to a grid; transmission to a distribution network; storage (such as pumped hydro) where applicable; and distribution to the ultimate users.

Each of these components has varying levels of competition and requires different levels of regulation. Power generation is becoming more competitive, as power is being provided by unregulated non-utility generators. Transmission systems remain largely regulated, but new approaches are being taken to encourage competition. Storage systems, normally part of a utility system, remain largely regulated, as does distribution to consumers.

The Public Utility Regulatory Policies Act (PURPA) was passed and required utilities both to buy from and sell to cogenerators, thus spawning a whole new industry. While legal limits remain on the types and capacities of plants, PURPA provided the beginning of a more competitive industry that will soon use all technologies. Estimates are that non-utility generation could account for one-quarter to one-third of new generation in the next ten years.

CONCLUSIONS AND POSITIONS

Desirable as it appears at the time, pursuit of ideals does not necessarily produce desirable results. For example, suppose the USA had achieved "energy independence", as was a national objective some years back. Oil, gas, uranium, and electricity would not be imported from Canada; low-cost oil would not be imported from the Middle East, Mexico, and South America; and coal use would be even more prolific.

How might the United States economy appear today as a self-sufficient energy nation? Oil would cost more than \$50 per barrel, rather than around \$20, and gasoline probably would be \$3 to \$4 per gallon. Domestic reserves likely would be depleted. Uranium would cost at least \$30 per pound, and probably over \$50, rather than \$8 per pound. Natural gas prices likely would be several times current levels. High-cost producers of all energy sources would operate at the mercy of protectionist trade laws subject to change by government whim. Federal money would be pouring into "renewables" with few practical applications in sight. Total national expenditures for energy

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imports would be less, but would be more than offset by a loss of exports due to the high cost of manufactured goods and agricultural products. Investors would favor foreign investment more strongly.

Under today's conditions, there is little point in exerting the effort to be self-sufficient in oil production, or to even significantly lower imports. Nor is there any point in pursuing a major breakthrough with renewables. Reality means avoiding reliance on unproven theories, and instead, relying on proven technologies until the evidence supports change. Such evidence does not exist today.

Given this as my view, what positions would I propose relative to the issues under debate?

Arctic National Wildlife Refuge Exploration

The environmental objection is rather poorly founded—more ideological than rational. The proposed exploration area is a tiny fraction of the ANWR and companies are capable of making excellent restorations of properties. Environmental concerns should not present an insurmountable obstacle.

One disadvantage is that using the reserves now means that they will not be available to the United States in the future. On the other hand, that must be balanced against the short-term advantages: jobs will be created, the trade balance will be improved, and Alaskans will benefit economically. On balance, the advantages favor exploration, provided there is economic potential.

> ***Suppose the USA had achieved "energy independence"...Oil would cost more than $50 per barrel, rather than around $20, and gasoline probably would be $3 to $4 per gallon. Domestic reserves likely would be depleted. Uranium would cost at least $30 per pound, and probably over $50, rather than $8 per pound.***

Oil Storage

Increasing storage will improve national security. Inventory should be increased, and feasible means are available. One approach, for example, could charge an import fee of a dollar a barrel (about a 5 percent levy) and use that levy to purchase oil for storage. The income of approximately seven million dollars per day would allow purchase of approximately 125 million barrels per year. The oil inventory would double in approximately four years, and more than quadruple in ten years. In an emergency, the resulting two billion barrel inventory could replace a full year of imports.

Nuclear

Simplified licensing is essential, but licensing reform alone is insufficient to renew the nuclear program. A more complete program is needed, including demonstration plants and a publicly acceptable waste disposal program. The objective should be to establish a foundation by the year 2000 for the expansion of nuclear-generated energy, based on proven, standardized designs.

Renewables

Modest funding of research and development for renewables should continue. The program should include pilot plants of sufficient size to demonstrate both the merits and the limitations. The purpose must be to obtain objective facts based on actual experience.

Conservation

This should be pursued, but only to its economic limits. Planning for conservation should be based on proof of what is achievable, rather than on theory derived from ideology. Again, a primary objective should be to learn the limitations.

The federal government need not, and should not, become the source of funds to implement conservation methods. If the advantages are real, economics will drive conservation. The market should not be distorted by resorting to subsidies. Moreover, bottom-up initiatives as provided by local utilities and others will be far more effective than top-down initiatives from the federal government.

Environmental Policy

Acid rain, ozone depletion, and global warming each require specific responses tailored to specific conditions. The Clean Air Act, a possible case of overkill, may have

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to be relaxed. Although ozone depletion is not totally understood, it does appear to have sufficient scientific backing to justify the current corrective measures. Global warming lacks the scientific basis to justify drastic actions, even though it seems prudent to promote efforts to minimize carbon dioxide emissions. The government's go-slow approach to global warming is about right.

Competitive Power Production

New legislation should increase freedom of competition in electrical generation. The path pioneered by PURPA has opened the way, and this path should be expanded and remaining obstacles removed.

> ***The actions under consideration in the government are, in fact, the sum of individual reactions to individual problems. At best, the current government thinking might be termed a limited tactical plan.***

CONCLUSION

A review of the issues raises two basic questions:

- Assuming that Congress adopts all the ideas that it is considering (even if broadened as I propose) would the cumulative program merit the status of a "National Energy Strategy or Policy"? The answer is no. The ideas Congress has before it would not meet the requirements of a comprehensive policy—a concept that would harness, harmonize, and direct the nation's technical, social, political, and economic resources toward a defined national goal. The actions under consideration in the government are, in fact, the sum of individual reactions to individual problems (such as ANWR). At best, the current government thinking might be termed a limited tactical plan.
- Assuming a comprehensive government-designed national energy strategy were achievable and capable of being implemented, would the nation be better off with or without it? I am very skeptical of the benefits of such a national policy. A de facto national energy strategy evolved from free market interactions may not always produce everything everyone would like. But the alternative of an agency attempting to control (EPA-style) an issue as complex, far-reaching, and all-important as energy, could be disastrous.

Implementation of any government policy requires control, and thus necessitates (or at least produces) legislation, regulations, incentives, penalties, reporting, inspection, staffs, etc. A new bureaucratic organization would almost certainly result. The new agency (could it be called the Energy Supply and Utilization Agency?) might be as pervasive as the 17,000-employee Environmental Protection Agency; as relentless as the Nuclear Regulatory Commission; and as slanted by ideology as the California Energy Commission. Government programs mix politics with economics and usually favor the politics. The payoff for more politics is less economics, and thus, less energy.

Government solutions may sound appealing, that is until one remembers living with the consequences of past discrepancies between policy intentions and program results (remember "energy independence"). In fact, the lack of a comprehensive policy is not the disadvantage many consider it to be. I would be much more concerned if the government had a comprehensive policy with the intention to implement it. Then, government's main function would be to distort the free market via centralized planning and control. History has demonstrated that we must maintain the protection that only a free market system provides, since only it can make the much-needed ongoing adjustments to change.

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1991 INDUSTRY DEVELOPMENTS

INTERNATIONAL

Major Nuclear Powers Agree to Apply Full-Scope Safeguards

France, the United Kingdom, South Africa, and the Soviet Union all announced in 1991 that they would apply International Atomic Energy Agency (IAEA) full-scope safeguards to all future contracts. However, customers of those countries with contracts negotiated prior to these announcements may be encouraged, but not required, to adhere to the safeguards. Over the last year and a half, Germany also has begun adhering to these safeguards, and Switzerland and Belgium are considering their application. Additionally, in August, China announced its intent to sign the Treaty for the Non-Proliferation of Nuclear Weapons (NPT). This makes it likely that China also will apply full-scope safeguards to its contracts.

China's action, in particular, increased pressure on North Korea, which had signed the NPT six years ago, yet still operated non-safeguarded facilities. Normally, safeguards agreements are ratified within two years of the signing of the NPT, but North Korea had not signed and ratified the specific agreements that would have allowed IAEA inspections of North Korean nuclear facilities. After months of negotiation, North and South Korea announced on December 30 that they intend to establish the Korean peninsula as a nuclear-weapons-free zone. On January 7, 1992, North Korea's ambassador to the IAEA announced that his country would sign the safeguards agreements before the end of the month.

The recent dissolution of the Soviet Union opens to question how and if its announced application of the safeguards will take place. A further question to be answered is which of the former Soviet republics will be included, and if they will proceed individually or separately.

Many Countries Lift Economic Sanctions Against South Africa

- On July 10, the United States lifted all its economic sanctions against South Africa, stating that the process of eliminating apartheid had been initiated and was irreversible. South African President F. W. de Klerk's request to Parliament in early 1991 to dismantle the last remaining legal foundations of discrimination was significant in this process.
- Japan lifted most trade sanctions in October, opening the way for Japanese companies to resume purchases of uranium from South Africa. Before 1988, when the sanctions went into effect, Japanese utilities were purchasing over ten percent of their uranium requirements from South African companies.
- Earlier in 1991, the European Community (EC) removed its sanctions, which apply to steel, iron, and gold coins. However, at that time, the EC maintained its support of UN sanctions applying to sporting events, arms, and crude oil.

IAEA Gains New Members

The IAEA accepted Yemen and the former Soviet republics of Lithuania, Latvia, and Estonia as members. These countries still must confirm their membership by depositing instruments of membership with the IAEA.

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AFRICA

South Africa's Uranium Production Drops Further; More Mines Close

South Africa's 1991 uranium production declined 33 percent from 1990, to 4.3 million pounds U_3O_8. With the closure of Buffelsfontein and ERGO during 1991, only four producers are currently operating: Hartebeestfontein, Palabora, Western Areas, and Vaal Reefs. Even Vaal Reefs has suspended production at its west plant. Despite most countries lifting their sanctions in 1991 against South African uranium, current market prices have precluded South African producers from regaining lost market share and volume.

Rössing Announces Further Cutbacks

Rössing Uranium Ltd. of Namibia announced in September that the company's Board had approved proposals to cut production to five million pounds U_3O_8 annually, from its previously reduced level of 6.5 million pounds. Rössing's production capacity exceeds ten million pounds U_3O_8 per year. Rössing has undertaken many cost-cutting measures in an effort to continue production through the depressed uranium market.

Uranium Production in Niger and Gabon Reduced

To reduce costs, Cogema of France has cut 20 percent of the work force of its subsidized Niger affiliates, SOMAIR and COMINAK. The company has also made cuts in COMUF, its Gabonese affiliate. Production from these three affiliates has been reduced to a level of 7.4 million pounds U_3O_8 per year, down approximately 25 percent from the level of recent years.

ASIA

Japan Progressing in Fuel Cycle Production and Reactor Technology

- In early October, co-operators Japan Nuclear Fuel Industries Co. and Japan Nuclear Fuel Services Co. opened Japan's first uranium enrichment facility near the village of Rokkasho. The facility has an initial capacity of 150,000 SWU per year. The site also has under construction a low-level nuclear waste burial site and a temporary storage facility. A reprocessing plant is planned as well. Residents of the Aomori Prefecture gave their implied approval of the site when they reelected the pro-nuclear governor early in February.
- On March 15, the Japan Atomic Energy Research Institute (JAERI) broke ground for a ¥80 billion (US$615 million) High Temperature Engineering Test Reactor at its Oarai Research Establishment. The reactor is scheduled to achieve criticality in 1995-1996.

The 30-GWt reactor will utilize specially fabricated uranium-dioxide (UO_2) fuel, mixed in various enrichments from 3 w/o to 10 w/o ^{235}U, and placed in a graphite reactor core. JAERI expects the primary coolant (helium) temperature to attain a maximum value of 950°C at the reactor exit, nearly triple the typical exit temperature of current light water reactors.

Japan Has Steady Growth in Nuclear Industry

Figures released by the Japan Atomic Industrial Forum late in 1991, covering FY 1990, showed a six-percent growth in industry spending, and a two-percent growth in mining and manufacturing revenues. Utility spending reached its second highest level ever in 1990, rising to ¥1.735 trillion (over US$13 billion), less than one-percent below the 1988 record. Mining and manufacturing sales rose to ¥1.768 trillion (US$13.6 billion).

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ASIA *(continued)*

Japan's New Reactor Plans and Start-Up

Japan announced plans to build as many as 40 new reactors over the next 20 years. These plans include two General Electric advanced boiling water reactors (BWR), the world's first such reactors. These advanced BWRs will be Tokyo Electric Power Company's units 6 and 7 at the Kashiwazaki-Kariwa station, and construction began in September. Also announced was the start of commercial operation of Hokkaido Electric Power Company's 550-MWe Tomari 2 reactor, which is Japan's forty-first reactor to reach commercial operation.

Reactor Incident Taints Japan's Growth Plan

On February 9, Kansai Electric Power Company's Mihama 2 470-MWe pressurized water reactor (PWR) suffered Japan's first necessary activation of an emergency core-cooling system. The rupture of a steam generator tube caused the incident. Although not that severe an incident by international standards, it was Japan's most severe incident during its nearly 30 years of nuclear power plant operation. An extensive study by the Ministry of International Trade and Industry (MITI) later determined that some anti-vibration bars installed during original construction were improperly placed or deformed. Despite no off-site implications and frequent and extensive steam generator tube inspections already required by MITI, a number of more stringent national policies have been instituted, as well as inspections of all similar reactors. Also in response to the incident, Kansai is creating a central laboratory specializing in nuclear plant safety.

Taiwan's AEC Conditionally Approves New Reactors

Taiwan's Atomic Energy Commission (AEC) has approved the Environmental Impact Assessment for Taiwan Power Company's (Taipower) plan for its seventh and eighth reactors. The AEC gave its approval based on Taipower's compliance with an extensive list of over 40 conditions.

China Announces Reactor Plans, First Start-Up

Early in 1991, Jiang Xinxiong, President of China National Nuclear Corporation, provided further details of China's nuclear power plans. The plans called for China to have six commercial nuclear power plants in operation by 1994, with a gross electrical output of at least 2,100 MW.

The original plan had three phases. The first included the start up of the domestically produced Qinshan 300-MWe PWR in 1991 and the Daya Bay 1 900-MWe reactor in 1992. Part of this phase was accomplished when the Qinshan reactor, China's first commercial nuclear power plant, achieved criticality on December 15. The second phase included a second, matching unit at Daya Bay by 1993, and at Qinshan, a matching 300-MWe unit plus two 600-MWe units by 1994. The third phase included an unspecified number of new plants by the year 2000 to raise nuclear-power-generated electricity to 6,000 MWe. Mr. Jiang also stated that China planned to increase total electrical generation from all sources to 810 billion kWh by 1996, up from the current level of 615 billion kWh.

However, since these plans were announced, the official start-up of Daya Bay 1 has been delayed until 1993. Although not yet official, it is likely the rest of the plan's announced schedule dates have slipped at least one year.

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ASIA *(continued)*

Korea Plans 13 More Reactors

Korea Electric Power Corporation announced in September that under the government's revised long-term development program, thirteen new commercial power reactors are planned for construction by 2006. These new reactors are in addition to the previously announced Wolsong 2 (680-MWe CANDU-type reactor) purchased from Atomic Energy of Canada Limited, and Uljin 3 and 4 (943-MWe pressurized water reactors) to be constructed with components supplied by ASEA Brown-Boveri/Combustion Engineering and General Electric Corporation. The thirteen additional reactors planned are five 700-MWe pressurized heavy-water reactors and eight 1,000-MWe PWRs.

India Discovers Its Largest Uranium Deposit

India's Department of Atomic Energy announced the discovery of a major uranium deposit at Domiasat, 140 kilometers south-west of Shillong, in the state of Meghalaya. The sandstone-type deposit covers an area of more than ten square kilometers, ranging in depth from approximately 5 to 50 meters. Ore grades reach as high as 0.41 % U_3O_8. The department states this is India's largest and richest known deposit.

India's AEC Plans Expansion of Nuclear Fuel Production, Plants, and Marketing

- India's Department of Atomic Energy announced it plans to invest over seven billion rupees (approximately US$270 million) in the next decade to build and expand its nuclear fuel production capability. Plans include increasing the UO_2 pellet production capacity at its Hyderabad uranium oxide fuel plant from 350 MT to 660 MT per year; building a uranium fuel assembly plant, also at Hyderabad; and commissioning a 150 MT-per-year zircaloy fabrication plant. The department also is planning to build a 300 MT-per-year zirconium sponge plant near Palayakayal in Tamil Nadu state.

  The government also allocated Rs900 million for the purchase of heavy water for its current and new reactors. The country can supply most, but not yet all, of its heavy water requirements from its plants in Baroda, Hazira, Kota, Manuguru, Nangal, Talcher, Thal, and Tuticorin.
- India has plans to market technology and products for nuclear power plants. The marketing effort is focusing on third-world countries since they do not require, and are least able to afford, sophisticated technology from the major industrialized nations. Egypt and Syria have already stated an interest in purchasing 5-MW research reactors. Details of all such transactions would be reported to the International Atomic Energy Agency.
- During 1991, India's Atomic Energy Commission selected Trikkareppur in the state of Kerala (on India's southwest coast) as the site for a proposed nuclear station. When completed, the station is expected to include eight 500-MWe (gross) units, making it the largest station in the country. Initial power generation from the first phase of four units is expected to occur in 1997. However, as the project is a cooperation between India and the former Soviet Union, plans and schedules are likely to change.
- India's eighth reactor, Narora 2, a 220-MWe pressurized heavy water reactor, achieved criticality late in 1991 and should enter commercial operation early in 1992.

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ASIA *(continued)*

Pakistan Signs Agreement With China for 300-MWe Plant

Announced in Beijing, China, on December 31 was the fact that the Pakistan Atomic Energy Commission has signed an agreement to purchase a nuclear power plant from China. A tentative agreement for the reactor purchase was first reached in 1989. The 300-MWe plant will be located in Chashma and should be in operation in 1998. Officials have stressed that the plant will be subject to IAEA safeguards.

AUSTRALIA

Uranium Mine Updates

- Western Mining Corporation and British Petroleum, owners of Australia's Olympic Dam project, announced in early 1991 that an eighteen-month, A$66-million expansion program was underway. The completed program will increase uranium production capacity by nearly sixteen percent, to 1,400 metric tons U_3O_8 per year (more than three million pounds) by mid-1992.
- Energy Resources of Australia, Ltd. (ERA) announced on November 4 a broad restructuring to be in full effect by 1992-1993. Uranium production will be decreased to a level in line with delivery commitments. Over 40 percent of the company's employees will be released as part of the restructuring.

Three-Mine Policy in Forefront of Uranium Mining Politics

Early in 1991, John Kerin, Australia's Federal Minister for Primary Industries and Energy, came out strongly for the abolition of the country's three-mine policy. Mr. Kerin's position was outlined in a submittal to the Australian Labor Party's (ALP) Uranium Review Committee. His letter described the three-mine policy as illogical, hampering development, and doing nothing to meet public concerns about the environment, health and safety, nonproliferation, and Aboriginal welfare.

The Uranium Review Committee subsequently determined that the three-mine policy was not in the best interest of the country and that the uranium industry should be expanded. However, at the behest of then-Prime Minister Robert Hawke, and contrary to the review committee's recommendations, the ALP voted during its biennial conference held in late June, to block any current expansion of Australia's uranium industry.

The new Prime Minister and head of the ALP, Paul Keating, is under pressure from the opposing National Party to reverse the three-mine policy. Also North Broken Hill Peko Ltd. (NBH) is attempting to persuade the federal government that the Jabiluka deposit and the existing Ranger mine should be considered a single entity, and that NBH thus should be allowed to develop Jabiluka within the constraints of the existing policy.

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EUROPE

Westinghouse, BNFL, and ENUSA Form New European Fuel Group

In an effort to optimize their investments in production and marketing, Westinghouse, British Nuclear Fuels Ltd. (BNFL), and Empresa Nacional del Uranio SA (ENUSA) recently formed the European Fuel Group (EFG). EFG has no personnel or headquarters, and required no monetary exchange for its formation. It is only a cooperative agreement among the three companies to pool their resources for the marketing, design, and manufacture of PWR fuel for the European market. Each company separately negotiates contracts but assigns the work to the appropriate member of EFG.

Westinghouse hopes to make gains in fuel manufacturing and related services after the dissolution of its agreement with ASEA Brown-Boveri. BNFL hopes to gain in markets for fuels using reprocessed materials, and ENUSA hopes to break into the European market for fuel fabrication.

Cogema to Close Uranium Division at La Crouzille by 1995

Cogema of France announced in the second quarter of the year that it will close mining operations at La Crouzille by 1995, citing that known reserves will only support another five years of production, and that mining costs exceed world market prices. The La Crouzille division, located in the Haute-Vienne region, has 10 mines with 600 employees, producing 40 percent of France's uranium production.

France Closes Chooz A After 24 Years of Operation

Due to high operating costs, Electricité de France (EdF) permanently shut down the Chooz A 305-MWe prototype pressurized water reactor on October 30. Chooz A was operated by EdF, and is owned by Société d'Energie Nucléaire Franco-Belge des Ardennes, a consortium formed by EdF and Belgian utilities.

France Opens Waste Site

ANDRA, France's national agency for the management of nuclear waste, officially opened its new FF1.2 billion Aube Storage Center for storage of low-level and medium-level wastes. The center has a capacity of one million cubic meters of short- and medium-term nuclear wastes. Plans call for the center to be filled by 2020 and have a design life of 300 years. The Aube Storage Center is intended to succeed the La Manche Storage Center which is already filled to its 0.5 million-cubic-meter capacity and will be closed and sealed in 1994.

German Utilities and EdF Continue Work on Inter-Investment Plans

In the first half of 1991, the German utilities of PreussenElektra (PREAG), Bayernwerk, and RWE Energie AG announced a proposal that would allow them to obtain an interest in Electricité de France (EdF). In return, EdF would gain a 15-percent interest in VEAG, the high-voltage distribution company for the former East Germany and the operator of the major brown coal power stations.

However, numerous political and legal issues have led to several revisions of the proposal. Political and labor groups in France strongly objected to German utilities gaining a share of EdF, France's national utility. After other proposals also were objected to, including one in which the German utilities would take a large ownership share of the new Civaux station, the most recent plan calls for the German utilities to gain a smaller share in the ownership of a number EdF power plants.

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EUROPE *(continued)*

(German Utilities continued)

In Germany, former East German municipalities are disputing the majority ownership of VEAG by the former West German utilities, and have, through a court appeal, delayed the purchase of VEAG by PREAG, RWE, and Bayernwerk. The latest proposal to allow EdF to invest in the German market calls for the three German utilities and EdF to form a production company to sell electricity to VEAG. Thus, VEAG would remain a German-owned company, as the remaining share of VEAG would be sold to former East German utilities, and not shared with EdF. The new German-French production company would actively market beyond German borders, throughout eastern Europe.

Germany to Close Its Only Nuclear Waste Site

Germany's only nuclear waste disposal facility, at Morsleben, will be closed following a decision by the Magdeburg District Court. The main basis of the court's decision was that Morsleben facility was being operated under a permit issued by the government of the former East Germany, and that permit was not automatically valid in the unified Germany, despite the Treaty of Unification that granted the facility a 10-year license as of July 1, 1990. Therefore, the court determined that the facility has no valid permit and must cease operations.

Germany Closes Down Last of Greifswald VVERs

The last operating unit of the four old-style (Model 230) Soviet-designed VVERs at the Greifswald station in eastern Germany was closed down near the beginning of 1991. The last unit, built in 1973, was closed because it could not meet the more stringent safety standards of the unified Germany. The other three Greifswald VVERs had already been shut down during 1990 for the same safety reasons; however closure of the last unit was delayed until completion of a substitute oil-powered generating station.

German Reactor Returns to Service After Legal Struggles

On August 21, Kernkraftwerk Obrigheim's 340-MWe (net) PWR reached full power after being shut down since May 1990 due to a legal challenge to its operating license. Opponents of the German reactor charged that the facility had been operating for over 20 years under a temporary license, and such a license did not allow operation over that length of time. A lower court concurred, but a federal court overruled that decision, stating the reactor's two partial operating licenses and eight regulatory appendices provided a legal basis for its continued operation.

Spain's ENUSA Begins Construction of Uranium Concentrates Plant

In early 1991, Empresa Nacional del Uranio SA (ENUSA), the Spanish nuclear fuel and fabrication company, began construction of a 950 ton-per-year uranium concentrates plant. The plant, which is scheduled for completion in three years, is located in the Salamanca province. Upon completion, it will be able to process all of Spain's requirements for uranium concentrates.

Spain's New Energy Plan to Continue Nuclear Moratorium

Spain's ruling Socialist party announced in mid-1991 that the country's new National Energy Plan will not permit the operation of any new nuclear plants before the year 2000, and instead, will depend upon natural gas to meet its growing electricity demand. Nuclear proponents had hoped the new energy plan would end the nuclear moratorium first imposed in 1984. With this announcement, utilities were again considering abandoning the incomplete reactors at Valdecabelleros and Lemoniz, rather than continuing their maintenance in a mothballed condition.

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EUROPE *(continued)*

Hungary Signs Deal to Use Soviet Fuel Cycle Services, Then Reconsiders

Hungary's state electricity utility, Magyar Villamos Müvek Tröszt (MVMT), reached an agreement in February with Atomenergoexport (AEE) of the Soviet Union for the purchase of fabricated fuel for use in Paks nuclear station's four VVER-440 units. A major factor, at that time, in the choice of AEE was that the Paks station's spent fuel would be taken by AEE for final disposal in the Soviet Union. The contract was to cover the entire operational life of the Paks units. MVMT sought competing Western offers, but no other offer contained a provision for the final disposal of spent fuel. Unlike prior fuel supply contracts with AEE, the contract required that AEE be paid in hard currency, not in transfer rubles, with payments negotiated annually.

In a separate contract in February, the Soviet Union agreed to purchase the yellowcake needed to produce the Paks fuel from the Mecsek mine at a price equivalent to world market prices.

Recent changes in the former Soviet Union and the high costs imposed by the Soviets, as well as a desire to establish more independence in fuel services, has led MVMT to alter its earlier position. MVMT decided at the end of 1991 not to send spent fuel back to the Soviet Union, and instead to develop domestic interim storage. In the near future, MVMT likely will request formal bids for methods to deal with its spent fuel.

Soviet Union Gives Up Ownership in Wismut Mines

On May 16, the Soviet and German governments signed an agreement whereby the Soviet Union gave up its 50-percent share of the Wismut uranium mines in Germany, in exchange for a release from any liability for the environmental cleanup of the mines.

Uranium Mines Close in Kazakhstan

Late in 1991, the Chalgi and Tassbulak uranium mines in Kazakhstan were closed, and production was further reduced at the open-pit mines on the Mangishlak peninsula. Many miners have left the company towns of the closed mines, and there are reports that much of the town supporting the Tassbulak mine is being dismantled. Some consideration is being given to the idea of converting one or more of the mines in Kazakhstan to an in-situ leach mining process.

Italian Firms Form Consortiums With Foreign Partners

- ABB Atom of Sweden, with Italy's Ansaldo S.p.A., and Fiat Componenti e Implanti (a Fiat subsidiary) formed a new consortium, Consorzio Pius. The consortium is to develop a design, based on ABB's PIUS light water reactor, that meets Italian licensing requirements, thereby positioning the new firm for a reconsideration of nuclear power by the Italian government. ABB owns 60 percent of Consorzio Pius; Ansaldo, 25 percent; and the Fiat subsidiary, the remaining 15 percent.
- Ansaldo agreed to create another consortium with Atomic Energy of Canada (AECL), that will complete Romania's Cernavoda 1 nuclear unit. The ultimate plan is for the Cernavoda station to have five units. AECL will supply the CANDU nuclear steam supply systems, while Ansaldo will be involved in the remainder of the plant. AECL and Ansaldo have a contract, worth approximately US$360 million, with Romania's nuclear utility, Regia Autonoma Nationala de Electricite (RENEL), for the reactor's completion.

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EUROPE *(continued)*

(Italian Consortiums continued)

The contract was conditional on RENEL's obtaining loans, arranged by the consortium, for funding the contract. On September 17, Canada's Export Development Corporation approved a loan to RENEL in the amount of C$315 million. Ansaldo agreed in the contract to obtain loans for the balance of the required funding.

Czechoslovakia Cuts Uranium Production

Now that the former Soviet Union has stopped its purchases of Czechoslovakian uranium, the Czech government has ordered a cut in uranium production. Even with these reductions, the country will be able to supply all its own nuclear fuel needs until at least 2005. The government will create a federal uranium reserve to accumulate excess domestic production, and will assess opportunities to sell uranium in the world market.

Czechoslovakia Updating VVERs and Receiving Bids for New Reactors

In January 1991, the Czechoslovakian government decided to continue operation at least through the end the year of the country's older Soviet-designed VVERs (Model 230), located at the Bohunice station, while some safety backfits were made. The entire backfit program will take two years and cost over US$100 million. The first backfits are for the improvement of emergency and fire-protection systems. If the backfit program is successful, the reactors may be approved for operation through 1995.

Early in 1991, a consortium of Czech enterprises, composed of Energoprojeckt, Ceske Energeticke Zavody, Slovenske Energeticke Podniky, Ceskoslovensky Uranovy Prumsyl Koncern, and a representative for the Czechoslovak Atomic Energy Commission requested bids for the design and construction of two 1,000 to 1,400 MWe nuclear power plants. The consortium's bid request asked for either PWR or BWR designs, and was receptive to alternative designs, including passively safe units. The second nuclear unit could be bid as an option. The initial requests were sent to ASEA Brown-Boveri, General Electric, Mitsubishi, Nuclear Power International, Westinghouse, and the Czech firm of Skoda.

Lithuania Concludes Agreement for Operation of Ignalina Station

The recently independent country of Lithuania reached an agreement in October with the Soviet Union's Ministry of Atomic Energy and Industry for the Ministry to continue its responsibility for the operation, safety, fuel, and equipment of the Ignalina station in Lithuania. The government of Lithuania formally took possession of the station August 27 and made the Lithuanian Ministry of Energy its new owner. However, the two Ignalina 1,380-MWe RMBKs (graphite-moderated, water-cooled reactors) will remain in the Soviet inventory under Soviet IAEA safeguards until Lithuania can complete the signing, ratifying, and enactment of the conditions in the Treaty on the Nonproliferation of Nuclear Weapons.

Lithuania to Get Assistance From Sweden in Creating Nuclear Agency

The Swedish Nuclear Power Inspectorate (SKI) will lead efforts to help Lithuania establish a nuclear regulatory agency and initiate an inspection program for its RBMK nuclear units. The program will include a probabilistic safety analysis, and a study of systems analysis, core physics, regulatory aspects, safety, and quality assurance. Lithuania, located not far from Sweden, has the world's two largest RBMK-type nuclear power plants, each rated at 1,380-MWe.

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EUROPE *(continued)*

Swiss Government Supports Capacity Increases for Nuclear Plants

In March, Swiss government officials announced their support of a plan to increase generating capacities of the country's nuclear power plants by at least 10 percent by the year 2000. Swiss utilities had proposed the capacity increases (ranging from 10 to 15 percent per unit) in May 1990, when substantial public opposition to construction of a sixth nuclear plant was apparent. On September 23, 1990, Swiss voters passed a referendum imposing a 10-year moratorium on all nuclear power plant licensing and construction. Therefore, in 1991, increasing unit capacities was the only option available to allow nuclear power to contribute to the nation's growth in generating capacity.

United Kingdom Reactor Updates

- In August, Scottish Nuclear's Hunterson B2 set a new record of 305 days of continuous operation by an advanced gas-cooled reactor. The previous record was just under 273 days. Later in 1991, Scottish Nuclear also completed its evaluation of the possibility of reopening Hunterson A. Uncertainties of near-term market conditions led the utility to end consideration of reopening the Magnox (graph moderated, gas-cooled) reactor, which was closed in 1990.
- Calder Hall 1, operated by British Nuclear Fuels Ltd., marked its thirty-fifth anniversary on October 17. The 50-MWe Magnox reactor was the world's first nuclear power plant built on an industrial scale.
- Construction on the United Kingdom's first pressurized water reactor (PWR), Sizewell B, is still ahead of schedule; it recently had its pressure vessel and containment dome installed.
- The Nuclear Installations Inspectorate of the United Kingdom has given Nuclear Electric approval to operate the Magnox reactors at Bradwell, Dungeness, Hinkley Point, and Sizewell to the end of their 30-year lifetimes in 1995. Prior to this announcement, the reactors had been given permission to operate only through the end of the year, until satisfactory results were obtained from reactor vessel embrittlement tests at Trawsfynydd.

NORTH AMERICA

Canadian Consortium Signs Cleanup Deal with Wismut

A consortium of Canadian firms signed an agreement in mid-1991 with Wismut AG, the former East German-Soviet mining company, to provide expertise and technology to clean up over 40 mines and tailings sites. Cost estimates for the cleanup range from US$7 billion to as high as US$20 billion, and may require 10-15 years to complete. Initial preparation and site analysis will begin in the fall of 1992.

Rio Algom Begins, Delays, Ends Merger With Uranium Resources

In late May, Rio Algom, Ltd. (RAL) and Uranium Resources, Inc. (URI) agreed to a merger in which Rio Algom Mining Corporation (which is owned by RAL) would acquire all outstanding URI shares. Rio Algom already had owned eight percent of URI. However, during third quarter 1991, the merger met an unexpected snag that postponed the deal. Both firms still supported the merger, but a Canadian tax issue arose that made the deal prohibitively expensive for Rio Algom. While there was hope to resolve this issue, on November 27 Rio Algom ended the merger agreement, citing the depressed uranium market. No comment was made regarding the effects of the tax law on the cancellation of the merger.

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NORTH AMERICA *(continued)*

Anti-Nuclear NDP Wins Elections in Saskatchewan

Continuing its success after winning elections in Ontario in September 1990, the New Democratic Party (NDP) emerged victorious in Saskatchewan's provincial elections on October 21, 1991. The NDP maintains a strong anti-nuclear platform and called for a moratorium on uranium production in Saskatchewan. Ironically, the NDP was last in power in Saskatchewan in the early 1980s and was instrumental in developing uranium mining in the province. While the Party now opposes nuclear power and uranium mining, its call for a moratorium is hedged by the provision that other employment must be found for the province's uranium miners before the moratorium is implemented.

Ontario Hydro Cancels, Revises Long-Term Uranium Contracts with Denison & Rio Algom

On April 29, Ontario Hydro notified Denison Mines, Ltd. that it would terminate its supply contract for over 3 million pounds of uranium per year, effective January 11,1993. Since Ontario Hydro is Denison's sole customer for its Elliot Lake production, and Denison subsequently stated its production costs at Elliot Lake are not competitive in the current world market, Denison has announced it will close Elliot Lake operations once deliveries to Ontario Hydro are completed in May 1992.

On June 17, 1991, Ontario Hydro's new chairman, Marc Eliesen, announced that, following negotiations with Ontario's New Democratic Party-controlled government, Ontario Hydro and Rio Algom had agreed to revise the termination date of Hydro's long-term contract with Rio. Under an economic obsolescence clause, the utility could have cancelled deliveries after 1993. However, deliveries now will continue through mid-1996 and the quantities will be increased. Hydro will still pay the original contract's above-market price for the 3.7 million pounds equivalent U_3O_8 to be delivered from now to mid-1993. The utility will pay a fee much closer to market price for an additional 5.9 million pounds above the original contract quantity. In addition, Ontario Hydro will provide a C$250-million contribution to the Elliot Lake economy.

Ontario Hydro Revises Long-Term Energy Plan

In response to the policies of Ontario's ruling New Democratic Party, Ontario Hydro announced in mid-December that it was dramatically revising its 25-year electric demand and supply plan. The revised plan will forego construction of any new generating plants in the foreseeable future, and instead, will rely upon independent power producers and demand-side management to meet reduced forecast load growth. This revision appears to scrap the original expansion program that called for ten new 880-MWe CANDU reactors by 2014.

Cameco Begins Privatization Process

In a long-awaited step, Cameco began its privatization process in June, with an initial public offering of 10.4 million shares of common stock. An offering later in the year boosted public ownership to 15.7 million shares, or over 30 percent of the company. The rest of the company is owned by the province of Saskatchewan (38.9%) and the Canadian government (30.8%).

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NORTH AMERICA *(continued)*

Canadian Government and Saskatchewan Government Form Joint-Review Panel

On April 18, the Canadian Federal Environmental Minister, Robert de Cotret, and the province of Saskatchewan's Environmental and Public Safety Minister, Grant Hodgins, announced the formation of a joint-review panel to "review the proposed uranium mining developments in northern Saskatchewan, and assess their acceptability." The review panel will "...focus on the environmental, health, safety, and socio-economic impacts of the proposed developments," and then report to the appropriate Ministers.

The panel was to have completed its final report on several proposed developments within 18 months. However, it took four months to name panel members, and they have moved very slowly thus far. As a result, Saskatchewan uranium producers are concerned that this panel may cause extended delays in the development process and create further uncertainty in the primary industry of the province.

Canadian Government to Remove Upgrading Requirements on Uranium

On December 13, Jake Epp, the Canadian Minister of Energy Mines and Resources, announced the government will be phasing out Canada's uranium upgrading policy. Similar to his announcement in 1990 interpreting the policy in light of the US-Canada Free-Trade Agreement, the new policy states that all new uranium sales contracts reviewed by the federal government after December 15, 1991, will not be subject to additional processing. Contracts signed before that date will still be subject to the policy, but contracted deliveries after December 31, 1995, will not be required to meet the policy, regardless of when the original contract was signed.

TENEX and CONCORD Form Joint Venture for Nuclear Fuel

CONCORD, a group of companies owned by Oren L. Benton, a Denver-based businessman, and v/o Techsnabexport (TENEX) of the Soviet Union, announced in June that they had formed a joint venture to market certain products and services of the Ministry of Atomic Energy and Industry (MAEI) of the Soviet Union, including all nuclear fuel products and services. The joint venture, called Global Nuclear Services and Supply, Ltd. (GNSS), has offices in Moscow, Zurich, and Washington, DC.

Energy Fuels Announces Joint Venture

On January 16, 1991, John Adams, Chairman of Energy Fuels, and Oren Benton, owner of NUEXCO, announced a joint venture involving all uranium operations of Energy Fuels. Energy Fuels, which was founded in 1972, has been the largest US uranium producer since 1986. The company holds over 20 million pounds of uranium reserves located in Mojave County, Arizona. The parties stated that the companies will remain separate participants in the nuclear fuel industry, cooperating where appropriate to strengthen each as a trading organization and as a producer.

Mr. Benton and the Adams family have equal interests in Energy Fuels' uranium operations. Mr. Adams and Mr. Benton serve as co-chairmen of Energy Fuels, with Mr. Adams continuing to direct its day-to-day operations. Mr. Benton was associated with Energy Fuels as Vice-Chairman prior to his purchase of NUEXCO.

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NORTH AMERICA *(continued)*

US Mining Changes

- On June 4, General Atomics (GA) based in San Diego, California, and Chevron Resources Company, a unit of Chevron Corporation of San Francisco, announced a definitive agreement whereby GA purchased all of Chevron's uranium assets in the USA and Canada. These assets included the Panna Maria uranium mill, a 55-percent share of the Rhode Ranch uranium mine in south Texas, the Mt. Taylor uranium mine in New Mexico (the largest known uranium deposit in the USA), and exploration properties in Saskatchewan, Canada.
- In the last quarter of the 1991, Power Resources Inc. (PRI) sold a 25-percent interest in its Gas Hills in-situ leach uranium project to UG Mining Inc., a US subsidiary of Urangesellschaft of Germany. The two companies then formed a joint venture to develop and manage the project, with production planned for 1997. PRI has estimated mineable reserves at Gas Hills, near Douglas, Wyoming, at about 20 million pounds U_3O_8.
- Pathfinder Mines, Inc. purchased Union Pacific Resources' Reno Creek in-situ leach (ISL) uranium property in northeast Wyoming. The purchase of this three-million pound reserve adds to Pathfinder's portfolio of properties in Wyoming that includes open-pit mines in the Gas Hills and Shirley Basin, and the Ruth and North Butte ISL properties.
- Total Minerals, operator of the Malapai/Total joint-venture uranium properties at Christensen Ranch, Wyoming, and El Mesquite, Texas, restarted those two projects on August 20. The ISL projects were restarted to establish production costs after a lengthy period of standby status. Production is being used to fulfill long-term contract commitments.

New-York LILCO Agreement Upheld in Highest NY Court

On October 22, the New York Court of Appeals, by a 4-3 decision, upheld the agreement between New York state and Long Island Lighting Co. (LILCO) that allowed LILCO to transfer ownership of the Shoreham nuclear power plant to the Long Island Power Authority (LIPA) for the sum of one dollar. The agreement also allowed LILCO to recover some of its $5 billion investment from ratepayers over an eleven-year period.

The 809-MWe (net) boiling water reactor was completed but never commercially operated due to public opposition. LILCO requested, but has not yet received, approval from the US Nuclear Regulatory Commission on a decommissioning plan, therefore LILCO, LIPA, and the New York Power Authority cannot yet proceed with full decommissioning efforts on the Shoreham Plant.

NRC Approves Rule for Reactor License Extension

On October 15, the Nuclear Regulatory Commission (NRC) unanimously approved new regulations for 20-year license extensions of US nuclear power plant. NRC Chairman, Ivan Selin, stated that the license extension process is "tough", as it requires the operating utility to submit the results of extensive technical analyses in support of its application to operate a reactor 20 years beyond its original 40-year license.

The new regulations do not require utilities to compile and submit documentation for the current licensing basis (CLB) for the plant. The CLB includes all NRC regulations, requirements, rules, and all utility commitments to the NRC over the operating life of the reactor. While the CLB

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NORTH AMERICA *(continued)*

(NRC Licensing continued)

would provide the NRC with useful additional information for considering the safety of the plant's operation in the extension period, it would require the utility to submit several thousand more documents, greatly increasing the cost of the application and the time necessary for review. Inclusion of the CLB in the application also might open a plant's current operation to intervenor actions. The license renewal review process allows for public comment, but only on issues relating to operation of a plant during the 20-year extension period, not on issues concerning its current 40-year license.

US Nuclear Utilities Pool $50 Million for Advanced LWR Development

The US nuclear industry announced in November that it has secured more than 90 percent of the utilities' commitment toward its $50-million share of funding for development of first-of-a-kind (prototype) engineering in the Advanced Light Water Reactor Program. Nuclear equipment vendors will contribute another $50 million after the first year of the program. These contributions by the US commercial nuclear power industry match the US Department of Energy's planned five-year infusion of $100 million into the engineering portion of the program.

DOE Awards NPR Construction Management Contracts, Then Drastically Reduces Size of Program

In the first quarter of 1991, the US Department of Energy (DOE) awarded two construction management contracts (each worth up to $4 million) for the first US New Production Reactor (NPR). Winners of the contracts were Bechtel National Inc., for a 2,500 MWt heavy water reactor (HWR) at the Savannah River site, and Fluor Daniel, for a 1,840 MWt modular high-temperature, gas-cooled reactor (MHTGR) at the Idaho National Engineering Laboratory. DOE expected to choose by December 27 which technology it would pursue to the completion of a demonstration plant.

However, the end of the Cold War has dramatically reduced strategic requirements for tritium. On December 16, Secretary of Energy James Watkins announced that funding for the NPR program had been cut by $145 million (about 28 percent) and that the two design teams (Ebasco and Cega) would have their budgets cut by 80 percent to help meet the new funding level. He also stated that the HWR and MHTGR designs are to be reduced in size to one-third or one-fourth of their original size. The impact of the funding cuts on the management contracts has not yet been announced.

Sequoyah Fuels Ordered Not to Restart Uranium Conversion Plant

On October 4, the Nuclear Regulatory Commission (NRC) issued an order to Sequoyah Fuels Corporation (SFC) prohibiting the restart of its Gore, Oklahoma uranium conversion plant. The facility will not be allowed to reopen until a plan to improve the plant's health and safety program, as well as its environmental program, is submitted to and approved by the NRC. SFC had shut the plant for a two-week routine maintenance period when the NRC issued the order. As of the year-end, SFC had made extensive improvements in the plant's operation and programs, but had not yet received approval to restart it.

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NORTH AMERICA *(continued)*

US Nuclear Power Plants

- On July 24, GPU Nuclear Corporation's 808-MWe Three Mile Island 1 (TMI 1) unit established a record of 480 days of continuous operation for a light water reactor, surpassing the standing record of 477 days. Then, on August 30, Pacific Gas & Electric's Diablo Canyon 2 1,087-MWe PWR broke that operation record by running continuously for 481 days. Diablo Canyon 2 had only held the honor for a few days when Kansas Gas & Electric's Wolf Creek 1,135-MWe PWR surpassed both records to set the record of 487 days of continuous operation, before shutting down for scheduled maintenance.
- Two US reactors surpassed the 100-billion kWh lifetime generation mark: Duke Power's 846-MWe Oconee 1 unit reached the achievement at 10:39 a.m. on July 28, and the following day, American Electric Power Company's 1,202-MWe Cook 1 unit also reached the mark. Only reactors in Germany and Belgium had previously attained that mark.
- Tennessee Valley Authority's (TVA) Browns Ferry Unit 2 reached full power in mid-August after several months of testing. The 1,065-MWe BWR had been shut down since March 1985 due to safety concerns at all three Browns Ferry units. Since that time, TVA has spent over $1.2 billion for improvement at the site to address those safety concerns.
- The 31-year old Rowe, Massachusetts, nuclear plant owned byYankee Atomic Electric Company was shut down voluntarily by the operators on October 1, in response to an NRC staff recommendation. The staff recommended that the 167-MWe PWR be shut down pending additional analysis of the plant's response to certain accident scenarios. The NRC is most concerned about the reactor's ability to withstand pressurized thermal shock from the sudden rush of cold water introduced in an emergency cooling situation. Yankee decided to keep the unit shut down through its planned refueling in April 1992, rather than petition the NRC to allow it to resume operations at the plant before the scheduled refueling. Yankee has been using the time to gather data on the embrittlement level of the pressure vessel, in hopes of satisfying the NRC's concerns about the safety of the oldest operational US commercial reactor. Yankee intends to present a substantial case to the NRC so that the Rowe unit is allowed to operate until the expiration of its license in 2000, and possibly to receive a license extension for operation until the year 2020. The embrittlement situation at the Rowe unit, and the handling of the issues by the utility and the NRC is perceived as a test case for the future operation and license extension applications of many older US reactors.
- On December 26, Public Service Company of Colorado (PSC) started moving spent fuel from its closed Fort St. Vrain gas-cooled reactor into its $17-million on-site modular vault dry storage system (MVDS). PSC has a 1965 contract in which DOE is required to accept the plant's spent fuel. DOE's acceptance of the spent fuel is due to the fact that the plant was formerly a one-of-a-kind demonstration plant of the US Atomic Energy Commission (predecessor to the DOE).

The spent fuel was to be moved to storage at the Idaho National Engineering Laboratory (INEL), but Idaho's government has objected in court to the shipments on a number of environmental and safety grounds. INEL already stores a substantial amount of spent fuel, but Idaho is becoming increasingly concerned that, with the delays in DOE's storage programs, INEL is being used as a "dumping ground", and a *de facto* storage center. Idaho is trying to pressure

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NORTH AMERICA *(continued)*

(US Nuclear Plants continued)

DOE to meet its interim storage requirements by using other methods in other locations. PSC has been caught in the middle of this struggle and finally decided, following further court rulings sustaining Idaho's objections, that it would move the fuel to the storage center rather than allow it to remain in the reactor core. PSC had resisted this initial move because the introduction of nuclear material into the MVDS means that the facility will require decommissioning, at a cost of about $1.5 million. However, as maintenance costs are reduced by about one million dollars per month when the fuel is in the MVDS, and since PSC expects further legal delays, the move became worthwhile. Also, PSC plans to convert the Fort St. Vrain facility to natural gas by 1998, and to meet that deadline, PSC needed to remove the fuel from the reactor core as one of the initial steps in the $350 million decommissioning program.

LES Files Application for US Enrichment Plant

Louisiana Energy Services (LES) filed an application with the NRC on January 31, 1991, for a license to construct and operate a uranium enrichment plant. The NRC may take up to two years to consider the application. If approved, the LES plant will be the first privately owned enrichment plant in the USA. Construction on the facility is planned to begin in early 1993, assuming timely NRC approval of the license. Concurrently, LES stepped up its efforts to gain financial commitments for construction and also increased its efforts to market the plant's potential production.

Anti-Dumping Petition Filed Against Former Soviet Union

On November 8, 1991, the Oil, Chemical, and Atomic Energy Workers Union and certain uranium producers with US production filed a petition with the US Department of Commerce and the US International Trade Commission (ITC) charging that uranium was being dumped in the United States by the Soviet Union and the individual republics that were part of the former USSR. The petition claimed that Soviet trade practices were causing injury and threatening further injury to the US uranium industry.

On December 3, 1991, the staff of the ITC held a public conference to investigate the petition. The purpose of the ITC investigation is to determine if injury to the domestic uranium industry has been caused by the Soviet imports. ITC procedure allowed the petitioners and the opposition each an hour at the conference to state their case. Only ITC staff were present to hear the testimony; they were allowed to interrupt with questions, but there was no cross-examination. After hearing the testimony and receiving briefs from each party elaborating their respective positions, the ITC staff assembled and analyzed the issues for the commissioners assigned to the case, who then made a preliminary determination whether to dismiss the petition or continue the investigation.

On December 18, the ITC commissioners made a preliminary decision that the issues merited further investigation. The procedure now is continued by the International Trade Administration of the Department of Commerce, which has 160 days to ascertain if, in fact, the Soviet uranium marketed in the USA was sold at less than fair market value.

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SOUTH AMERICA

Argentina and Brazil Sign Non-Proliferation Accord

At a meeting of Latin American leaders in Guadalajara, Mexico on July 18-19, the presidents of Argentina and Brazil signed an accord outlining their mutual agreement on the peaceful uses of nuclear energy. The treaty outlines specific measuring systems for the accounting of nuclear-related material. On December 13 in Vienna, Austria, the presidents also signed draft safeguards agreements with the International Atomic Energy Agency (IAEA) confirming the intention of their earlier accord. Their agreement with the IAEA is compatible with the Treaty for the Prohibition of Nuclear Weapons in Latin American (Tlatelolco Treaty) and likely will lead to the implementation of full IAEA non-proliferation safeguards.

Uruguay's Plans for 600-MWe CANDU Reactor on Hold

Until other energy alternatives can be examined, the government of Uruguay put on indefinite hold its plan for an Atomic Energy of Canada, Ltd. (AECL) 600-MWe CANDU-type pressurized, heavy-water reactor. The government indicated that the availability of new energy alternatives had significantly altered its situation after discussions were initiated with AECL. The alternatives include Paraguay's offer to sell Uruguay electricity, and a discussion by Brazil and Argentina to construct a natural gas pipeline that could give Uruguay access to a supply of natural gas.

Uruguay's three million people depend on hydroelectric power for nearly 75 percent of their electricity requirements, but recent droughts have severely hampered normal levels of electrical generation. A plan for a 600-MWe nuclear power plant had been initiated with AECL, with Uruguay planning to export excess electricity to Brazil and Argentina.

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NUCLEAR INDUSTRY CALENDAR

1992

Feb. 23-25 *INFO Centers Workshop* (Marriott Hotel, Palm Beach Gardens, Florida).
Sponsored by the U. S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

March 22-25 *Fuel Cycle Conference '92* (OMNI Charleston Hotel, Charleston, South Carolina).
Sponsored by the U. S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

April 8-10 *Research and Development in the Nuclear Industry* (Peterhouse, University of Cambridge, England).
Sponsored by the Institution of Nuclear Engineers and the British Nuclear Forum.
Contact: Ms. Ipek Yigit, Manager for Public and Industrial Affairs, British Nuclear Forum; phone: 071-828-0116; Fax: 071-828-0110; Address: 22 Buckingham Gate, London, SW1E 6LB, England.

April 8-10 *25th Japan Atomic Industrial Forum Conference* (Pacifico Yokohama, Yokohama, Japan).
Contact: Department of Planning and International Affairs, Japan Atomic Industrial Forum, Inc.; 81-3-3508-2411; Fax: 81-3-3508-2094; Address: 1-1-13 Shimbashi, Minato-ku, Tokyo 105, Japan.

April 12-16 *8th Pacific Basin Conference* (Taipei, Taiwan).
Sponsored by the Amercian Nuclear Society.
Contact: ANS Meetings Department; 708-352-6611.

April 26-28 *INFO '92 Conference* (OMNI Charlotte Hotel, Charlotte, North Carolina).
Sponsored by the U. S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

May 5-7 *Annual Meeting on Nuclear Technology '92* (City Conference Hall, Karlsruhe, Germany).
Sponsored by the German Nuclear Society and the German Atomic Forum.
Contact: Congress Office JK'92; INFORUM GmbH, Heussallee 10, W-5300 Bonn 1; Phone: 0228-507-223.

May 15-17 *19th Annual Meeting & Int'l Conference on Nuclear Energy* (Hotel Diplomat, Prague, Czech.).
Sponsored by World Nuclear Fuel Market.
Contact: Donna Cason; 404-447-1144; Fax: 404-447-1797.

Sept. 20-23 *International Uranium Seminar '92* (Hyatt Regency Hotel, Lake Tahoe, Nevada).
Sponsored by the U. S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

Sept. 21-23 *Second International Conference on Training for Operation & Maintenance in the Nuclear Industry* (The Moat House International Hotel, Stratford-upon-Avon, United Kingdom).
Sponsored by the Institution of Nuclear Engineers.
Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.

Nov. 15-18 *Nuclear Energy Forum* (Fairmont Hotel, Chicago, Illinois).
Sponsored by the U. S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

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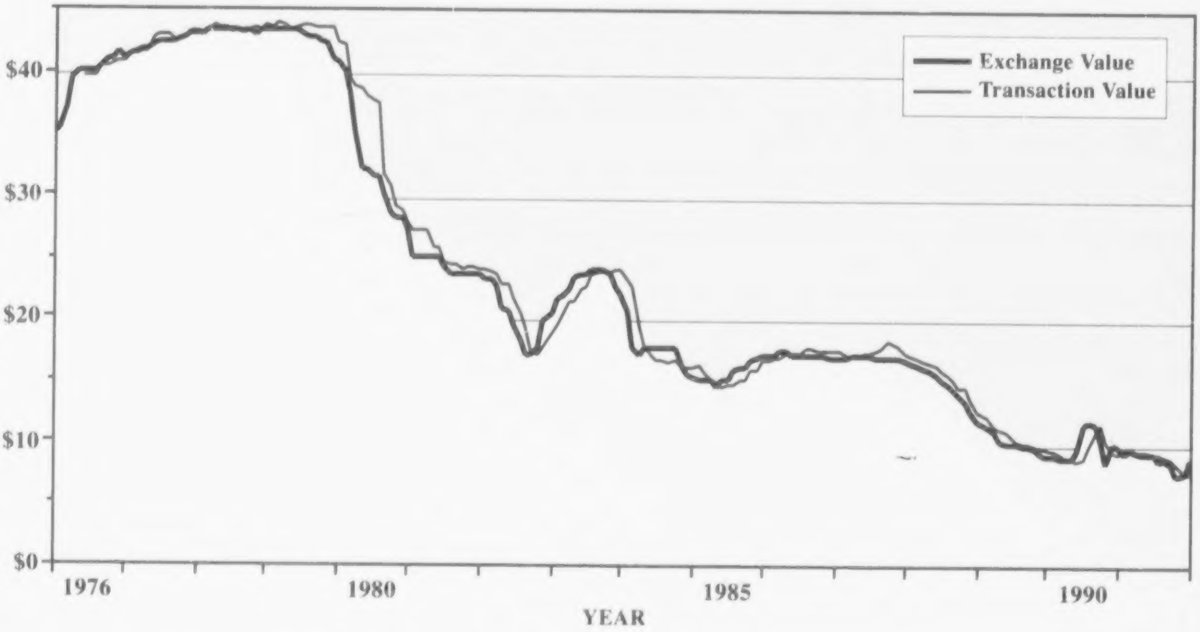
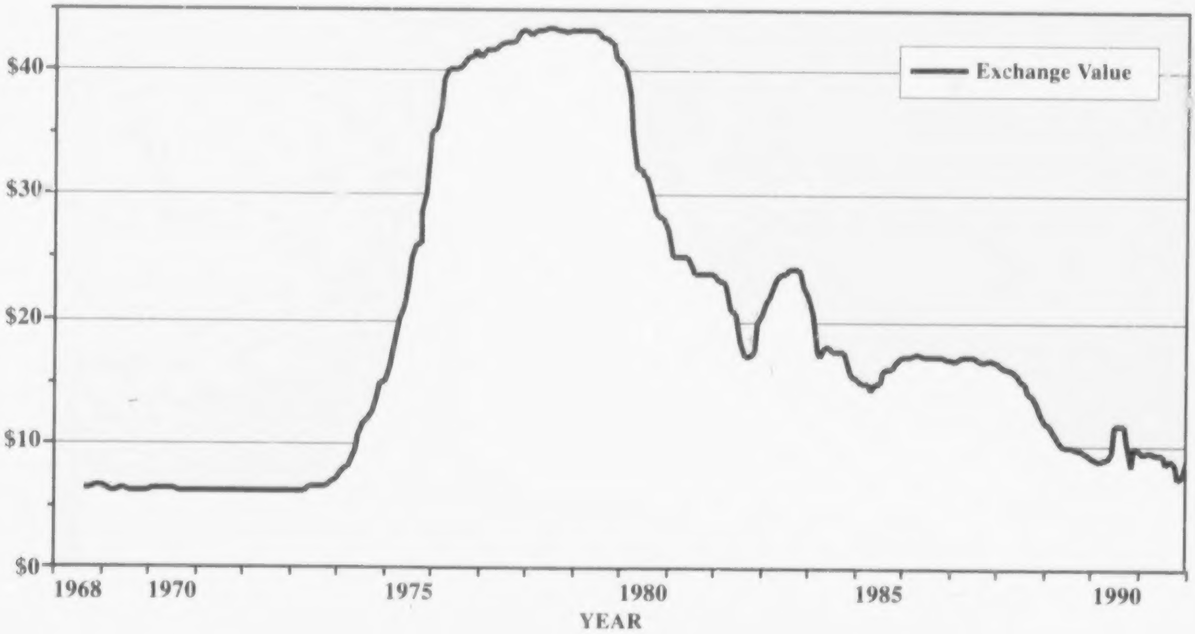
HISTORICAL MARKET DATA

NUEXCO HISTORICAL EXCHANGE VALUE AND TRANSACTION VALUE

(in US dollars per pound U_3O_8)





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HISTORICAL MARKET VALUES

Exchange Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	9.80	9.70
1991	9.10	9.50	9.30	9.10	9.20	9.05	8.55	8.75	8.40	7.25	7.40	**8.75**

US Premium (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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HISTORICAL MARKET DATA

UF6 Values

Determined as of the last day of the month indicated ($US/kg U as UF6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29.50	24.75	28.75	28.75
1991	27.50	27.75	27.50	27.25	27.60	27.25	25.75	26.25	25.50	22.75	22.75	**26.00**

US Premium (Relative to the UF6 Value)

Determined as of the last day of the month indicated ($US/kg U as UF6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

Conversion Values

Determined as of the last day of the month indicated ($US/lb U as UF6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
1991	1.45	1.45	1.45	1.45	1.50	1.50	1.50	1.60	1.55	1.55	1.55	**1.55**

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Transaction Values

Determined as of the last day of the month indicated ($US / lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	9.30	9.15
1991	9.40	9.45	9.35	9.30	9.30	9.20	9.15	8.95	8.70	8.35	7.45	**7.50**

SWU Values

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	51	51
1991	51	50	52	52	54	59	66	67	67	68	68	**70**

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Loan Rates

Determined as of the last day of the month indicated (Percent per Annum)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1991	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	**3.00**

* Float with Prime Rate

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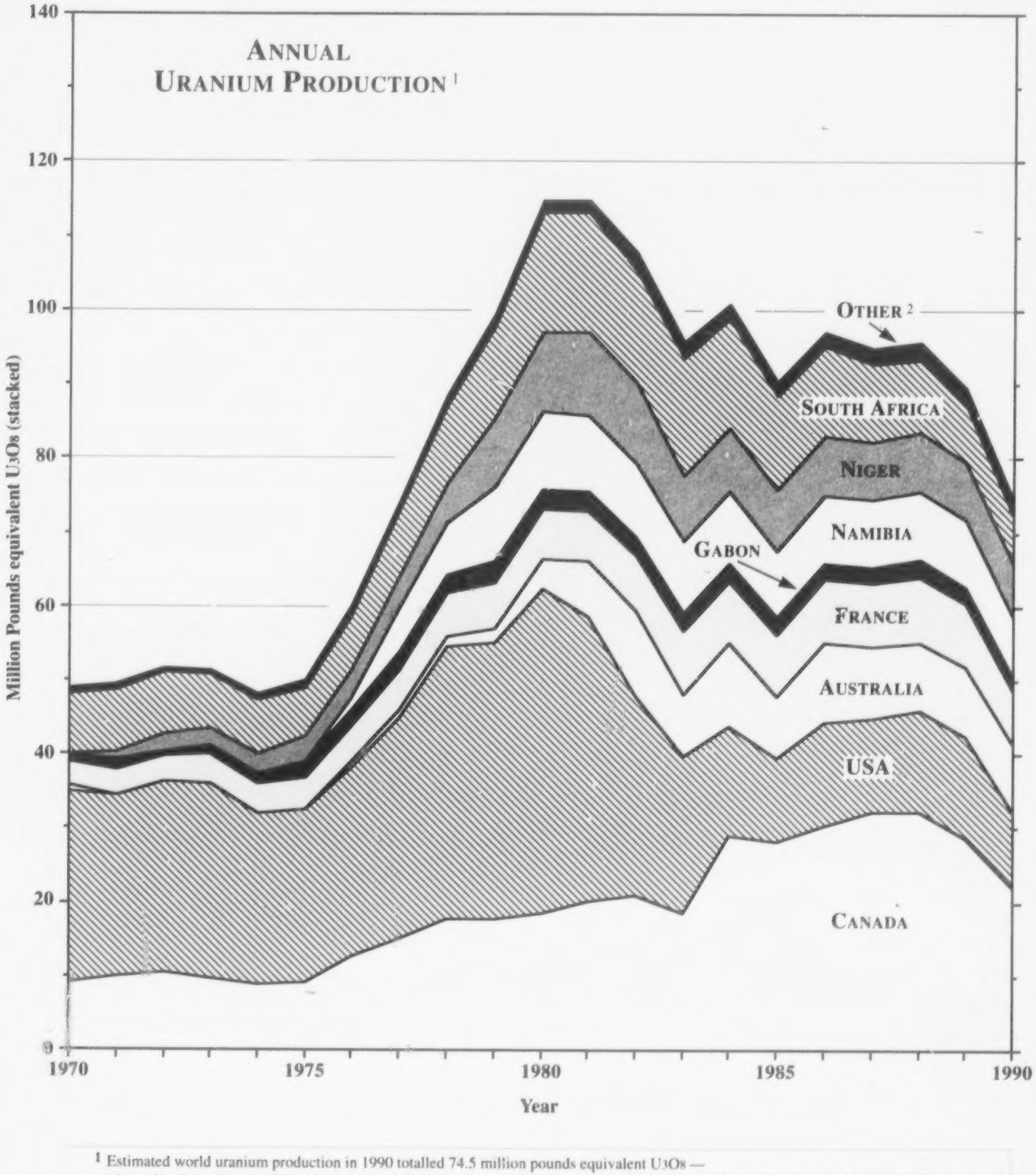

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[1] Estimated world uranium production in 1990 totalled 74.5 million pounds equivalent U_3O_8 —
(Australia: 9.1 – Canada: 22.0 – France: 7.4 – Gabon: 1.8 – Namibia: 8.0 – Niger: 7.4 – South Africa: 6.4 – USA: 10.2 – Other[2]: 2.2)

[2] **Other** includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, western Germany, and Yugoslavia

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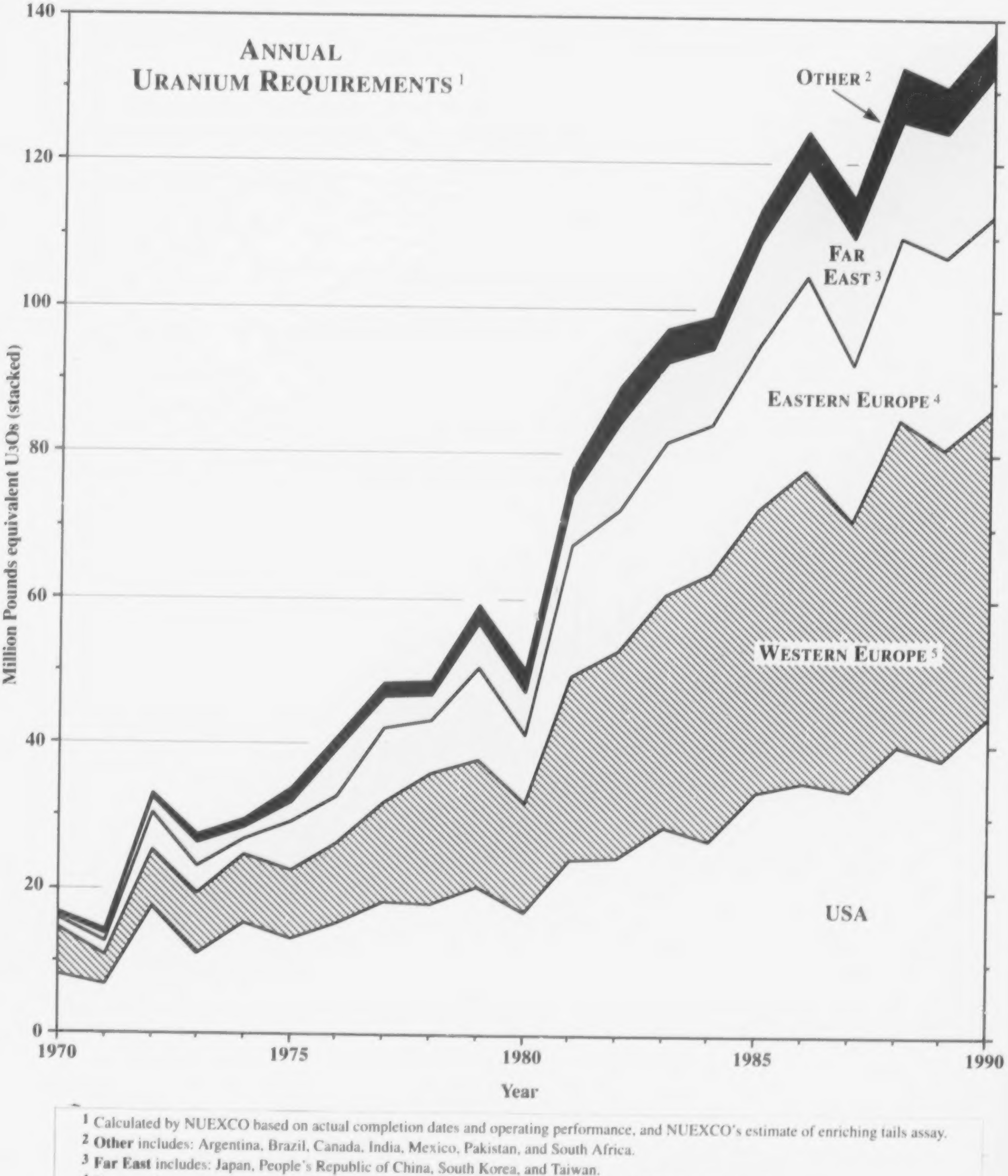

[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assay.
[2] **Other** includes: Argentina, Brazil, Canada, India, Mexico, Pakistan, and South Africa.
[3] **Far East** includes: Japan, People's Republic of China, South Korea, and Taiwan.
[4] **Eastern Europe** includes: Bulgaria, Czechoslovakia, E. Germany, Finland, Hungary, USSR, and Yugoslavia.
[5] **Western Europe** includes: Belgium, France, W. Germany, Italy, The Netherlands, Spain, Sweden, Switzerland, and UK.

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Australia

Year	Period [1]	Consumer Price Index [2] (1980/1981 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups [3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia [4] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates [5] (June 1985=100)
1980	Avg.	95.8	83.1	—	69.6
1981	Avg.	105.0	85.9	—	76.1
1982	Avg.	116.7	89.0	—	86.4
1983	Avg.	128.5	96.9	—	89.9
1984	Avg.	133.6	98.0	—	96.0
1985	Avg.	142.6	107.3	—	100.0
1986	Avg.	155.5	101.5	—	104.9
1987	Avg.	168.7	108.9	465.88	112.9
1988	Avg.	180.9	111.8	496.90	115.4
1989	Avg.	194.6	117.0	534.65	126.0
1990	Avg.	208.7	123.4	571.43	129.7 **R**
Jan	1990	—	119.2	—	128.3
Feb	1990	—	120.8	555.80	128.3
Mar	1990	204.1	121.5	—	128.7
Apr	1990	—	119.9	—	129.0
May	1990	—	118.9	566.60	129.2
June	1990	207.4	116.6	—	129.8
July	1990	—	116.4	—	129.9
Aug	1990	—	122.4	574.10	130.0
Sept	1990	208.9	128.2	—	130.3
Oct	1990	—	134.1	—	130.7 **R**
Nov	1990	—	133.7	589.20	130.7 **R**
Dec	1990	214.5	128.8	—	130.9 **R**
Jan	1991	—	125.6	—	130.9 **R**
Feb	1991	—	121.5	597.70	130.9 **R**
Mar	1991	214.1	119.1	—	131.1 **R**
Apr	1991	—	117.6	—	131.3 **R**
May	1991	—	117.8	592.00	131.3 **R**
June	1991	214.4	120.4	—	131.3 **R**
July	1991	—	120.4	—	131.3 **R**
Aug	1991	—	119.9	599.50	131.7 **R**
Sept	1991	—	118.3	—	131.9 **R**
Oct	1991	—	118.7	—	132.0

P = Preliminary **R** = Revised since last month

[1] Monthly data for the period 1967 to 1990 appears in Report 278.
[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1980 to June 1981 = 100.0). Figures shown at end of quarter represent quarterly average.
[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0).
[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (Catalogue No. 6312.0). Figures for the latest fourteen months shown are subject to revision.
[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (Catalogue No. 6302.0).

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Canada

		Industrial Products Price Index: All Commodities[1] (1986 = 100)[2]	Consumer Price Index: All Items (1986 = 100)[3]	Wage-earner Data: Average Hourly Earnings (C$)[4]				
				Uranium Mines (SIC 057)	Metal Mines (SIC 051-059)	Mines, Quarries and Oil Wells (SIC 051-099)	Metal Rolling, Casting and Extruding (SIC 298)	Chemicals and Chemical Products Industries (SIC 372-379)
1980	Avg.	75.9	67.2	—.—	—.—	—.—	—.—	—.—
1981	Avg.	83.6	75.5	—.—	—.—	—.—	—.—	—.—
1982	Avg.	89.0	83.7	—.—	—.—	—.—	—.—	—.—
1983	Avg.	92.1	88.5	17.22	14.86	14.18	10.67	11.09
1984	Avg.	96.3	92.4	17.89	15.85	14.97	11.11	11.68
1985	Avg.	99.0	96.0	18.53	16.47	15.56	11.85	12.12
1986	Avg.	100.0	100.0	19.38	16.70	15.76	12.28	12.58
1987	Avg.	102.8	104.4	20.12	17.15	16.11	12.58	13.20
1988	Avg.	107.2	108.6	20.91	18.51	16.95	13.17	13.77
1989	Avg.	109.4	114.0	21.97	20.02	18.41	13.71	14.16
1990	Avg.	109.7	119.4	22.90	20.93	19.12	14.62	15.28
Jan	1991	111.1	125.0	23.79	21.79	19.78	14.66	15.89
Feb	1991	110.6	125.0	25.23	22.45	20.13	14.63	16.10
Mar	1991	109.8	125.5	24.19	22.22	20.27	15.21	16.47
Apr	1991	109.1	125.5	24.77	22.50	20.31	14.63	16.64
May	1991	108.6	126.1	24.38	22.17	20.25	15.05	16.55
June	1991	108.5	126.7	23.58	22.13	19.90	14.65	16.51
July	1991	108.2	126.8	24.70	22.33	19.93	14.56	16.36
Aug	1991	107.8	126.9	23.78	22.01	20.00	14.62	16.24
Sept	1991	107.6	126.7	24.23	22.27 **R**	20.38 **R**	14.89 **R**	16.47 **R**
Oct	1991	107.6	126.5	24.44 **P**	22.16 **P**	20.41 **P**	15.06 **P**	16.47 **P**
Nov	1991	—	127.0	—.—	—.—	—.—	—.—	—.—

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1990 is found in Report 278.

[2] New Base Year of 1986 as of Report 266. Previous Base Year was 1981.

[3] New Base Year of 1986 as of Report 264. Previous Base Year was 1981.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1990 is found in Report 278.

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South Africa

		Average Declared Working Costs per Metric Ton of Gold Ore Milled [1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled [2] (March 1982 = 100)	Consumer Price Index [3] (1990 = 100)	Production Price Index All Groups [4] (1985 = 100)	Total Employment in Mining and Quarrying [5]	Total Salaries and Wages in Mining and Quarrying [5] (1,000 Rand)
							Annual Total [6]
1980	Avg.	35.50	—	25.5	55.2	709,042	2,237,689
1981	Avg.	41.87	—	29.4	62.7	722,918	2,756,928
1982	Avg.	47.23	103.9	33.7	71.4	702,041	3,181,584
1983	Avg.	51.88	115.0	37.8	79.0	700,901	3,563,282
1984	Avg.	58.95	130.3	42.2	85.6	711,511	4,134,390
1985	Avg.	68.70	151.7	49.1	100.0	724,587	4,778,612
1986	Avg.	80.18	177.9	58.2	119.6	756,637	5,767,950
1987	Avg.	95.01	223.1	67.6	136.2	751,864	6,911,395
1988	Avg.	106.69	241.1	76.2	154.1	705,355	7,774,054
1989	Avg.	116.65	273.0	87.4	177.5	700,360	8,833,934
1990	Avg.	129.37	305.3	100.0	198.9	677,742	10,193,209
							Monthly Total
Jan	1991	—	—	107.7	216.1	648,944	935,839
Feb	1991	—	—	109.0	216.9	650,948	893,373
Mar	1991	137.66	323.82	110.0	215.3	651,843	924,930
Apr	1991	—	—	111.5	216.5	639,939	887,722
May	1991	—	—	113.2	218.4	630,481	887,107
June	1991	134.65	317.23	114.0	219.3	640,908 **R**	890,595
July	1991	—	—	115.5	221.2	637,581	881,182 **R**
Aug	1991	—	—	117.1	222.8	613,704	934,308
Sept	1991	137.11	329.05	118.7	225.2	—	—
Oct	1991	—	—	119.8 **R**	228.3	—	—

P = Preliminary **R** = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in Report 278.

[2] Page 16 of Report 178 contains description and calculation of index.

[3] Central Statistical Service, Pretoria: All income groups-weighted average, Historical Data by month appears in Report 278.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in Report 236.

[6] Annual total is shown, rather than monthly average, for indicated year.

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United States

		Producer Price Index[1]		Consumer Price Index[2] (1982-1984 = 100)	GNP Implicit Price Deflator[3] (1982 = 100)	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
		Industrial Commodities (1982 = 100)	All Commodities (1982 = 100)			Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
1980	Avg.	88.0	89.8	82.4	85.7	10.26	10.63	8.31	6.94
1981	Avg.	97.4	98.0	90.9	94.0	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	100.0	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	103.9	12.58	13.43	10.58	8.66
1984	Avg.	103.3	103.7	103.9	107.7	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	110.9	13.38	13.74	11.57	9.46
1986	Avg.	100.0	100.2	109.6	113.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	117.7	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	121.3	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	126.3	13.59	13.72	13.09	10.05
1990	Avg.	115.8	116.3	130.7	131.5	14.10	14.36	13.54	10.32
Jan	1991	119.3	119.0	134.6	—	14.73	14.63	13.85	10.60
Feb	1991	117.2	117.2	134.8	—	14.80	14.55	13.81	10.59
Mar	1991	115.6	116 1	135.0	134.8	14.93	14.55	13.85	10.55
Apr	1991	115.6	116.0	135.2	—	14.85	14.56	13.96	10.63
May	1991	116.1	116.5	135.6	—	14.79	14.52	14.01	10.66
June	1991	116.1	116.4	136.0	136.1	14.88	14.51	14.05	10.74
July	1991	116.0	116.1 **R**	136.2	—	15.09	14.56	14.16	10.77
Aug	1991	116.4	116.2	136.6	—	14.82	14.64	14.06	10.78
Sept	1991	116.2	116.0	137.2	136.9	15.04 **R**	14.59 **R**	14.21 **R**	10.84 **R**
Oct	1991	116.6	116.4	137.4	—	14.95 **P**	14.76 **P**	14.25 **R**	10.75 **R**
Nov	1991	116.7	116.4	137.8	—	—·—	—·—	14.38 **P**	10.85 **P**

P = Preliminary **R** = Revised since last month

[1] US Bureau of Labor Statistics, Washington, DC: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents Historical ata is presented in Report 278.

[2] US Bureau of Labor Statistics, Washington, DC: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in Report 278.

[3] US Department of Commerce, Washington, DC: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted. Historical data is presented in Report 278.

[4] US Bureau of Labor Statistics, Washington, DC: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in Report 278.

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US Uranium Marketing Activities Statistics

— Compiled from data published by the US Energy Information Administration [1] —

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers [2] (million pounds U_3O_8)	Average Price of Delivered Uranium [2] ($/lb. U_3O_8)	Quantity of Uranium Imported [3] (million pounds U_3O_8)	Average Price of Imported Uranium ($/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	$16.10	3.6	n/a	1.2
1977	29.9	27.8	$19.75	5.6	n/a	4.0
1978	37.0	31.6	$21.60	5.2	n/a	6.8
1979	37.5	33.0	$23.85	3.0	n/a	6.2
1980	43.7	35.0	$28.15	3.6	$43.10	5.8
1981	38.5	32.6	$34.65	6.6	$32.90	4.4
1982	26.9	23.5	$38.37	17.1	$25.19	6.2
1983	21.2	24.2	$38.21	8.2	$26.16	3.3
1984	14.9	22.5	$32.65	12.5	$21.86	2.2
1985	11.3	21.7	$31.43	11.7	$20.08	5.3
1986	13.5	18.9	$30.01	13.5	$20.07	1.6
1987	13.0	20.8	$27.37	15.1	$19.14	1.0
1988	13.1	17.6	$26.15	15.8	$19.03	3.3
1989	13.8	18.4	$19.56	13.1	$16.75	2.1
1990	8.9	20.5	$15.70	23.7	$12.55	2.0

P = Preliminary **R** = Revised since last month

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity*.
1984-1990: Energy Information Administration, *Uranium Industry Annual*.

[2] Data for 1976-1981 includes both domestic utilities and agents.

[3] Includes imports by domestic utilities and domestic suppliers.

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Volume and Price of Uranium Deliveries To The European Community[1]

— Compiled from data published by the Euratom Supply Agency —

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price in ECU per pound U_3O_8	Medium or Long-Term Contracts[3] Average Price in US Dollars per pound U_3O_8	Spot Contracts[3] Average Price in ECU per pound U_3O_8	Spot Contracts[3] Average Price in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19
1990	12,800	16.7	ECU 23.08	$29.39	ECU 7.60	$ 9.68

P = Preliminary **R** = Revised since last month

[1] The twelve European Community member nations are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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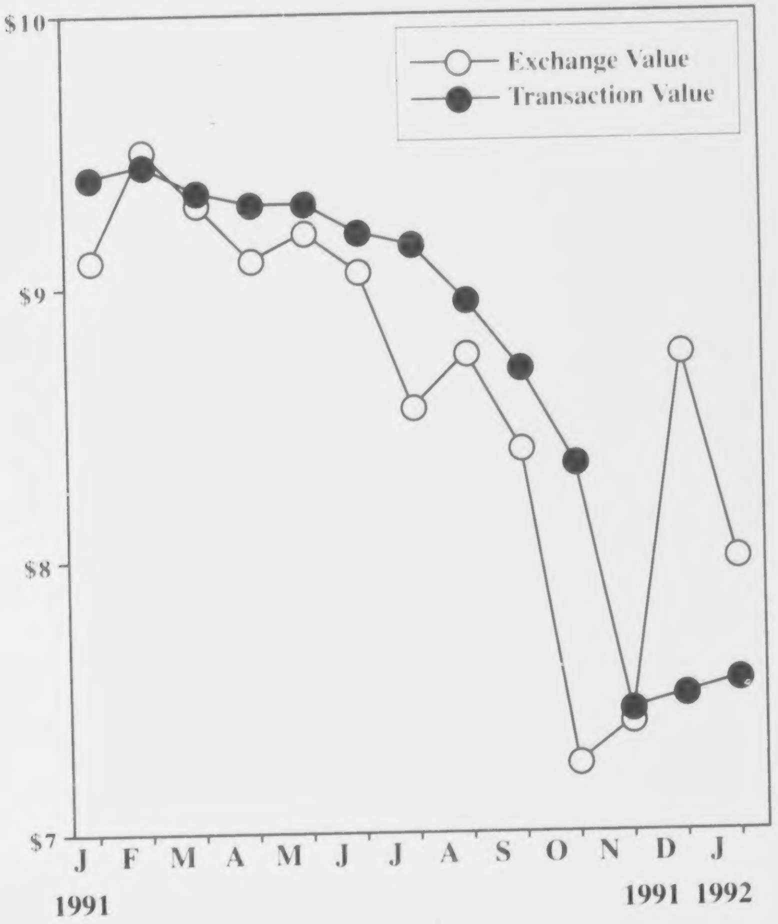

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- **Ontario Hydro**

Ontario Hydro is the largest nuclear utility in Canada, operating 18 nuclear power reactors with a capacity totalling almost 13 thousand MWe. The utility's 81 hydroelectric, fossil-fueled, and nuclear generating stations have a total capacity of 31,472 MWe. Hydro delivers power to municipal utilities, and large industrial consumers, and to several hundred thousand customers in rural and remote areas.

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To Our Readers

NUEXCO will be hosting a hospitality suite at the US Council for Energy Awareness Fuel Cycle '92 Conference to be held March 22-25 in Charleston, South Carolina. We look forward to seeing you there.

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MARKET REVIEW

Market Values Summary

NUEXCO Market Values	This Report January 31, 1992	Last Report December 31, 1991	12 Months Ago January 31, 1991
EXCHANGE VALUE [1]	**\$8.00** / lb equivalent U_3O_8	\$8.75	\$9.10
UF_6 VALUE [2]	**\$24.50** / kg U as UF_6	\$26.00	\$27.50
LOAN RATE [3]	**3.0%** / annum	3.0%	3.5%
CONVERSION VALUE [4]	**\$1.60** / lb U as UF_6	\$1.55	\$1.45
SWU VALUE [5] **(0.3 w/o tails assay)**	**\$71** / SWU	\$70	\$51
TRANSACTION VALUE [6]	**\$7.55** / lb equivalent U_3O_8	\$7.50	\$9.40
Transactions	**28**	26	18
Months	**3**	3	3
Millions of Pounds	**8.5**	8.0	3.1

DEFINITIONS

1 The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

2 The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

3 The **Loan Rate** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

4 The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

5 The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

6 The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

a) Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;
b) At least ten transactions;
c) Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US\$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.
- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.
- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight-percent U^{235} and a product assay of 3.0 weight-percent U^{235}, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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FEBRUARY MARKET REVIEW

(as of January 31, 1992)

OVERVIEW

The NUEXCO Exchange Value fell $0.75, to $8.00 per pound U_3O_8, as aggressive sellers pursued limited demand during the first half of January. Market activity proved sporadic, with most transactions occurring during the second week of the month.

Eight concentrates sales were reported, totalling over 1.5 million pounds equivalent U_3O_8 for near-term delivery (**Table 1**). No natural UF_6 transactions were reported, but the UF_6 Value declined $1.50, to $24.60 per kgU as UF_6, following the price decline in the concentrates market. One near-term enriched UF_6 sale was reported containing a small quantity of equivalent feed and SWU. Two transactions were reported in the long-term market, involving 2.3 million pounds equivalent U_3O_8 for 1994-1998 delivery.

January's nine near-term transactions for over 1.5 million pounds equivalent U_3O_8 of natural and enriched uranium well exceeds the average for January activity. In the previous five years, January activity averaged only four near-term transactions totalling less than 800 thousand pounds equivalent U_3O_8.

The Conversion Value edged up $0.05, to $1.60 per pound U as UF_6. Only one near-term transaction was reported for a moderate quantity of conversion services. The Loan Rate remained unchanged at 3.0 percent per annum. Four loans totalling almost 1.2 million pounds equivalent U_3O_8 were reported.

The SWU Value continued its steady ascent, climbing one dollar, to $71 per SWU. One near-term sale was reported involving SWU contained in EUP, and three long-term enrichment transactions, completed in 1991, were also reported.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	January 1991		Year-to-Date	
	No. of Sales	Volume[1]	No. of Sales	Volume[1]
Concentrates	8	1.5	8	1.5
Natural UF_6	0	0.0	0	0.0
EUP	1	<0.1	1	<0.1
Total[2]	**9**	**1.5**	**9**	**1.5**

[1] Million pounds equivalent U_3O_8
[2] Due to independent rounding, columns may not equal total.

NATURAL URANIUM AND CONVERSION

The concentrates market began the year in the upper $8 range, but as sellers sought to place material, they were forced to offer progressively lower prices to conclude sales. Prices had risen rapidly during the end of 1991, peaking in December. Prices then declined, as potential buyers, influenced in part by expectations of an increase in supply, deserted the market. As a result, the **Exchange Value** declined $0.75, to **$8.00** per pound U_3O_8, with most of the drop occurring early in the month. The majority of the sales occurred during the second week of January. None of the reported transactions occurred in the first or third weeks. By the end of the month, selling pressure appeared to ease somewhat and a few discretionary buyers re-entered the market to evaluate offers. These actions limited the price decline.

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Eight near-term concentrates transactions were reported, for a total exceeding 1.5 million pounds equivalent U_3O_8. At least six sales were made by US entities, with producers and intermediaries actively selling material during the month. Utilities, producers, and intermediaries all made purchases; these buyers included both European and US companies. All eight transactions called for delivery within the next three months and nearly all were concluded at price levels at or near the January 31 Exchange Value.

* * *

The **UF_6 Value** dropped $1.50, to **$24.50** per kgU as UF_6. The January UF_6 market was inactive with no natural UF_6 transactions reported. This 5.8 percent price drop still yields a UF_6 Value at a slight premium over the sum of the value of its components—concentrates and conversion. This reflects the current situation in the market of limited, but sufficient, UF_6 supply available to meet any emerging UF_6 demand.

* * *

In the long-term uranium market, two transactions were reported, both of which occurred in mid-1991. Two utilities purchased a total of 2.3 million pounds equivalent U_3O_8 in the form of concentrates from US producers for delivery during the period 1994-1998.

Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply[1]	Active Demand[1]
• Uranium (thousand lbs equivalent U_3O_8)	3,045	1,525
• Supply/Demand Ratio:	2.0	
• Loan (thousand lbs equivalent U_3O_8)	1,395	0
• Conversion (thousand lbs U as UF_6)	880	1,280
• SWU (thousand SWUs)	400	95

[1] Supply and Demand tables in the Market Review section of this Report provide details for each category.

* * *

The **Transaction Value** climbed $0.05, to **$7.55** per pound U_3O_8, continuing to reflect the low-priced, high-volume sales of November and early December. The January 31 Transaction Value was based on 28 transactions over 3 months involving 8.5 million pounds equivalent U_3O_8.

* * *

Active uranium supply declined by approximately one million pounds for the second consecutive month, falling to **3.0** million pounds equivalent U_3O_8. **Active uranium demand** climbed by over 600 thousand pounds, to **1.5** million pounds equivalent U_3O_8. In the face of declining prices, sellers were less aggressive toward month end, even as lower prices caused a few discretionary buyers to re-enter the market. Nevertheless, active supply is twice the demand level with the supply/demand ratio at 2.0.

* * *

The **Loan Rate** remained at **3.0** percent per annum. Loan supply declined from 6.0 million pounds, to 1.4 million pounds (**Table 2**), as some potential lenders withdrew from the market. Nevertheless, almost 1.2 million pounds equivalent U_3O_8 were borrowed by intermediaries during January. US and European utilities lent both concentrates and UF_6 in the four loans reported for the month.

* * *

The **Conversion Value** edged up $0.05, to **$1.60** per pound U as UF_6, as the market has become increasingly uncertain regarding future conversion supplies at current price levels. Only one transaction was reported in which a utility purchased a moderate quantity of conversion services at a price that can be evaluated near the January 31 Conversion Value.

ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

The **SWU Value** continued its ten-month climb, increasing one dollar, to **$71** per SWU. Pending demand combined with less aggressive sellers led to this price strengthening. Market activity was limited during January, but several buyers are expected to solicit offers within the next two months.

Only one near-term transaction, involving an unidentified buyer purchasing small quantities of equivalent feed and SWU contained in enriched uranium product (EUP), was reported. Three long-term SWU sales also were reported, but all involved utility purchases for small quantities made during 1991 for delivery in the second half of this decade.

Table 3
ENRICHMENT PRICES
(January 31, 1992)

Prices	This Month Report 282	Last Month Report 281	12 Months Ago Report 270
NUEXCO SWU Value ($US per SWU)	71	70	51
US DOE SWU prices: ($US per SWU)			
USEC	121.50[1]	121.50[1]	117.85[2]
AFC	153.00[3]	153.00[3]	153.00[3]
Requirements	157.00[3]	157.00[3]	157.00[3]
Incentive Price (IP2)	104.67[4]	104.67[4]	100.68[5]
Calculated worth of enriched UF_6[6]: ($US per KgU as UF_6)			
2.0 w/o U^{235}	222	227	198
2.5 w/o U^{235}	311	318	274
3.0 w/o U^{235}	404	412	352
3.5 w/o U^{235}	498	508	431
4.0 w/o U^{235}	595	606	512
4.5 w/o U^{235}	692	705	593

[1] Effective 10/1/91.
[2] Effective 10/1/89 to 9/30/91.
[3] Effective since 10/1/84.
[4] Provisional IP2 for FY92: Effective 10/1/91 to 9/30/92, for up to 30% of annual requirements.
[5] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.
[6] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 w/o ^{235}U tails assay.

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RECENT TRANSACTIONS

Uranium Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5330	1992	Less Than 50	98-102	Producer	Producer	
5332	1994-98	1,001-3,000	See Remarks	Utility	Producer	Occurred in mid-1991
5333	1994-97	601-1,000	See Remarks	Utility	Producer	Occurred in mid-1991
5340	1992	50-100	98-102	Producer	**R**	
5341	1992	101-300	98-102	Utility	Intermediary	
5342	1992	301-600	98-102	Utility	Intermediary	
5343	1992	50-100	98-102	**R**	Intermediary	
5351	1992	101-300	**R**	**R**	Intermediary	
5352	1992	101-300	90-97	Intermediary	Producer	
5354A	1992	Less Than 50	See Remarks	**R**	Intermediary	Contained in EUP
5356	1992	101-300	98-102	**R**	Intermediary	

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Exchange Value or UF_6 Value. The endpoints of each range are included within that range.

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RECENT TRANSACTIONS

Natural Uranium Loans[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Loan Rate	Borrower	Lender	Remarks
5344	1991	101-300	Above 110	Intermediary	Utility	
5345	1991	101-300	Above 110	Intermediary	Utility	UF_6
5350	1992	101-300	Above 110	Intermediary	Utility	UF_6
5355	1992	601-1,000	98-102	Intermediary	Utility	

Conversion Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range[2] of Current Conversion Value	Buyer	Seller	Remarks
5349	1992	101-300	**R**	Utility	Intermediary	

Enrichment Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity[3] (thousand SWU)	Price Within Percentage Range[2] of Current SWU Value[4]	Buyer	Seller	Remarks
5334	1996-97	50-100	**R**	Utility	**R**	1991 Transaction
5335	1996-97	Less Than 50	**R**	Utility	**R**	1991 Transaction
5336	1996-98	50-100	**R**	Utility	**R**	1991 Transaction
5354B	1992	Less Than 50	See Remarks	**R**	Intermediary	Contained in EUP

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., **X** dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

Uranium Supply

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE TO PURCHASE:				
ACTIVE				
91-1505	500	—	1992	
91-1506	500	—	1992	
91-1507	500	—	1992	
91-1511	260	—	1992	UF_6
91-1512	785	—	1992	UF_6
90-1231*	500	500 per year	1992-1995	
91-1268*	—	600 per year	1992-1999	
TOTAL	**3,045**			
INACTIVE	**4,930**			
AVAILABLE TO LOAN:				
ACTIVE				
92-1008*	495	—	—	UF_6
92-1017*	900	—	—	U_3O_8
TOTAL	**1,395**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 91-1502
Active Projects removed since last month: 90-1057A, 91-1084, 91-1219, 91-1220, 91-1241, 91-1260, 91-1292

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NUEXCO

MARKET REVIEW

SUPPLY AND DEMAND

Uranium Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Quantity (Thousand Pounds equivalent U_3O_8) Intermediate or Long-term[2]	Delivery Period	Remarks
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1247*	500	—	1992	UF_6
91-1297	150	—	1992	
92-1000*	390	—	1993	UF_6
92-1021*	250	—	1992	
92-1027*	100	—	1992	
92-1029A*	120	—	1992	$UF_{6}e$
92-1034*	15	—	1992	
91-1118	—	300 per year	1993-1998	U_3O_8/UF_6
91-1184	—	350 per year	1993-1997	
91-1290	—	310 per year	1995-1999	U_3O_8/UF_6
91-1294	—	250 per year	1996-2000	
92-1015*	—	1,300 per year	1995-2004	
91-1197	—	2,210	1992-1997	U_3O_8/UF_6
91-1227A	—	60	1992-1994	$UF_{6}e$
91-1232A*	—	500	1993-1994	$UF_{6}e$
91-1283	—	5,225	1994-2000	U_3O_8/UF_6
92-1030*	—	5,500	1992-1993	U_3O_8/UF_6
TOTAL	**1,525**			
INACTIVE	**1,600**			

INQUIRIES TO BORROW: *No inquiries to borrow are reported*

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* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 91-1245, 91-1272, 91-1293A, 91-1516.

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SUPPLY AND DEMAND

Conversion Supply and Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF_6) Within 3 Years[1]	Beyond 3 Years[1]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1500	440	—	1992	
91-1501	440	—	1992	
TOTAL	**880**			
INACTIVE	*None reported*			
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1174*	660	—	1992	
91-1275	620	—	1992	
91-1299	—	330	1993-1997	
TOTAL	**1,280**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 91-1301.

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SUPPLY AND DEMAND

SWU Supply And Demand

NUEXCO Project Number	Quantity (Thousand SWUs) Spot or Near-term[1]	Quantity (Thousand SWUs) Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1509	200	—	1992	
91-1515*	200	—	1992	
TOTAL	**400**			
INACTIVE	**685**		—	
INQUIRIES TO PURCHASE:				
ACTIVE				
92-1029B*	25	—	1992	UF_6e
92-1031*	70	—	1992	
90-1196	—	60 per year	1995 on	
91-1142	—	75 per year	1995-2000	
92-1016*	—	170 per year	1996-2006	
91-1152	—	2,700	1995-2001	
91-1171	—	560	1995-1998	
91-1227B	—	35	1992-1994	UF_6e
91-1232B*	—	500	1993	UF_6e
91-1250	—	45	1993	UF_6e
92-1024*	—	20	1993	
TOTAL	**95**			
INACTIVE	**185**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: *none*

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Exchange Value[1]

Country (currency)	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
	This Month (Jan 31, 1992)	**Last Month (Dec 31, 1991)**	**12 Months Ago (Jan 31, 1991)**	**This Month (Jan 31, 1992)**	**Last Month (Dec 31, 1991)**	**12 Months Ago (Jan 31, 1991)**
Australia (dollar)	10.66	11.51	11.59	27.71	29.93	30.14
Belgium (franc)	265.78	273.69	280.09	690.97	711.54	728.16
Canada (dollar)	9.40	10.11	10.57	24.43	26.29	27.47
EC (ecu)	6.31	6.53	6.63	16.41	16.96	17.23
Finland (markka)	35.16	36.15	32.87	91.41	93.97	85.44
France (franc)	43.96	45.33	46.04	114.29	117.84	119.68
Germany (mark)	12.90	13.26	13.57	33.55	34.46	35.27
Italy (lira)	9,696	10,040	10,171	25,207	26,102	26,442
Japan (yen)	1,006	1,092	1,195	2,616	2,839	3,106
Netherlands (guilder)	14.52	14.94	15.25	37.75	38.83	39.65
So. Africa (comm. rand)	22.42	23.99	23.18	58.27	62.36	60.26
So. Korea (won)	6,113	6,639	6,525	15,892	17,260	16,963
Spain (peseta)	811.61	845.08	847.69	2,110	2,197	2,204
Sweden (krona)	46.87	48.42	50.61	121.84	125.89	131.58
Switzerland (franc)	11.48	11.87	11.52	29.84	30.86	29.96
Taiwan (dollar)	200.00	223.12	242.29	519.96	580.07	629.91
UK (pound)	4.48	4.68	4.64	11.65	12.17	12.07
US (dollar)	8.00	8.75	9.10	20.80	22.75	23.66

Transaction Value[1]

Country (currency)	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
	This Month (Jan 31, 1992)	**Last Month (Dec 31, 1991)**	**12 Months Ago (Jan 31, 1991)**	**This Month (Jan 31, 1992)**	**Last Month (Dec 31, 1991)**	**12 Months Ago (Jan 31, 1991)**
Australia (dollar)	10.06	9.87	11.97	26.15	25.66	31.13
Belgium (franc)	250.83	234.59	289.32	652.10	609.89	752.17
Canada (dollar)	8.87	8.67	10.91	23.05	22.53	28.37
EC (ecu)	5.96	5.59	6.85	15.49	14.54	17.80
Finland (markka)	33.18	30.98	33.95	86.27	80.55	88.26
France (franc)	41.49	38.85	47.55	107.86	101.00	123.63
Germany (mark)	12.18	11.36	14.02	31.66	29.54	36.44
Italy (lira)	9,150	8,606	10,506	23,789	22,373	27,314
Japan (yen)	949.81	935.98	1,234	2,469	2,433	3,209
Netherlands (guilder)	13.70	12.80	15.76	35.62	33.28	40.96
So. Africa (comm. rand)	21.15	20.56	23.94	55.00	53.45	62.25
So. Korea (won)	5,769	5,690	6,740	14,998	14,794	17,522
Spain (peseta)	765.95	724.36	875.64	1,991	1,883	2,276
Sweden (krona)	44.23	41.51	52.28	114.99	107.90	135.92
Switzerland (franc)	10.83	10.17	11.90	28.17	26.45	30.95
Taiwan (dollar)	188.75	191.25	250.28	490.71	497.20	650.67
UK (pound)	4.23	4.01	4.79	10.99	10.43	12.47
US (dollar)	7.55	7.50	9.40	19.63	19.50	24.44

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[1] As of May 1991 Report #273; calculated using currency exchange rates **for** the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273; calculated using currency exchange rates published in *The Wall Street Journal* **on** the last business day of the month.

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Conversion Value[1]

	per lb U as UF_6			per kg U as UF_6		
Country (currency)	This Month (Jan 31, 1992)	Last Month (Dec 31, 1991)	12 Months Ago (Jan 31, 1991)	This Month (Jan 31, 1992)	Last Month (Dec 31, 1991)	12 Months Ago (Jan 31, 1991)
Australia (dollar)	2.13	2.04	1.85	4.70	4.50	4.07
Belgium (franc)	53.16	48.48	44.63	117.19	106.89	98.39
Canada (dollar)	1.88	1.79	1.68	4.14	3.95	3.71
EC (ecu)	1.26	1.16	1.06	2.78	2.55	2.33
Finland (markka)	7.03	6.40	5.24	15.50	14.12	11.55
France (franc)	8.79	8.03	7.34	19.38	17.70	16.17
Germany (mark)	2.58	2.35	2.16	5.69	5.18	4.77
Italy (lira)	1,939	1,779	1,621	4,275	3,921	3,573
Japan (yen)	201.28	193.44	190.39	443.75	426.45	419.74
Netherlands (guilder)	2.90	2.65	2.43	6.40	5.83	5.36
So. Africa (comm. rand)	4.48	4.25	3.69	9.88	9.37	8.14
So. Korea (won)	1,223	1,176	1,040	2,695	2,593	2,292
Spain (peseta)	162.32	149.70	135.07	357.86	330.03	297.75
Sweden (krona)	9.37	8.58	8.06	20.66	18.91	17.78
Switzerland (franc)	2.30	2.10	1.84	5.06	4.64	4.05
Taiwan (dollar)	40.00	39.52	38.61	88.18	87.14	85.11
UK (pound)	0.90	0.83	0.74	1.98	1.83	1.63
US (dollar)	1.60	1.55	1.45	3.53	3.42	3.20

SWU Value And UF_6 Value[1]

	SWU Value at 0.30 w/o Tails Assay			UF_6 Value per kg U as UF_6		
Country (currency)	This Month (Jan 31, 1992)	Last Month (Dec 31, 1991)	12 Months Ago (Jan 31, 1991)	This Month (Jan 31, 1992)	Last Month (Dec 31, 1991)	12 Months Ago (Jan 31, 1991)
Australia (dollar)	94.60	92.11	64.97	32.64	34.21	35.03
Belgium (franc)	2,359	2,190	1,570	813.95	813.26	846.41
Canada (dollar)	83.39	80.89	59.21	28.78	30.04	31.93
EC (ecu)	56.02	52.20	37.15	19.33	19.39	20.03
Finland (markka)	312.05	289.17	184.19	107.68	107.41	99.32
France (franc)	390.15	362.60	285.01	134.63	134.68	139.12
Germany (mark)	114.52	106.04	76.04	39.52	39.39	41.00
Italy (lira)	86,050	80,321	57,002	29,693	29,834	30,737
Japan (yen)	8,932	8,736	6,696	3,082	3,245	3,611
Netherlands (guilder)	128.86	119.49	85.48	44.46	44.38	46.09
So. Africa (comm. rand)	198.94	191.89	129.90	68.65	71.27	70.05
So. Korea (won)	54,252	53,111	36,567	18,721	19,727	19,718
Spain (peseta)	7,203	6,761	4,751	2,486	2,511	2,562
Sweden (krona)	415.93	387.38	283.95	143.53	143.88	152.95
Switzerland (franc)	101.88	94.95	64.59	35.16	35.27	32.83
Taiwan (dollar)	1,775	1,785	1,358	612.50	662.99	732.20
UK (pound)	39.75	37.44	26.01	13.72	13.91	14.03
US (dollar)	71.00	70.00	51.00	24.50	26.00	27.50

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[1] As of May 1991 Report #273; calculated using currency exchange rates **for** the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273; calculated using currency exchange rates published in *The Wall Street Journal* **on** the last business day of the month.

RECENT DEVELOPMENTS

France

Cogema to Purchase UG

In mid-January, Cogema, the French fuel cycle conglomerate, announced the pending purchase of a majority interest (between 51 percent and 70 percent) in Urangesellschaft mbH (UG) of Germany. Based on more recent information, Cogema, wholly owned by Commissariat à l'Energie Atomique (CEA), will purchase approximately 60-percent of UG from its principal owners, VEBA and STEAG.

UG is currently owned by the Germany energy group VEBA (33.3 percent), the utility PreussenElektra AG (PREAG)—a wholly owned subsidiary of VEBA (11.7 percent), and by STEAG AG (55 percent) which is also controlled by VEBA. Vereinigte Elektrizitäts und Bergwerks Aktiengesellschaft, renamed VEBA AG in 1970, is one of Germany's largest companies; its primary activities involve electricity, petroleum, chemicals trading, and transportation. VEBA holds the controlling interest in STEAG AG through two companies— Gesellschaft für Energiebeteiligung (GfE) and Ruhrkohle AG (the largest coal mining company in Germany)—which together own over 96 percent of STEAG. VEBA ultimately controls over 67 percent of UG, through its interest in STEAG and PREAG.

The exact ownership shares of each company in UG following completion of the sale have not yet been announced, although it is known that VEBA-controlled entities will maintain at least a 30-percent interest in UG. The transaction must be reviewed by anti-trust authorities in both countries, and accordingly, will not be finalized for a few months.

The purchase would be another step in Cogema's efforts to diversify its activities within the uranium industry. UG's ownership interests in various mining properties worldwide complement Cogema's current properties. Selected ownership interests of each company are shown in **Figure 1**. UG owns shares of uranium projects in Namibia, Australia, the USA, Niger, and Canada. With the UG purchase, Cogema would acquire: an additional interest in Somair in Niger; an indirect interest in Kiggavik (a property in the Baker Lake region of the Northwest Territories, which will geographically diversify its Canadian ownership interests, currently all Saskatchewan properties—Cigar Lake, Cluff Lake, and McArthur River); additional shares in Energy Resources of Australia (particularly since Pancontinental, a company partially owned by Cogema, sold its Jabiluka deposit to ERA); an indirect, 5-percent share of the Rössing deposit in Namibia; and additional properties in the USA (Gas Hills, Wyoming).

Another asset in the UG portfolio is its joint-venture relationship with Techsnabexport of the former Soviet Union. That joint venture, Internexco, was established in 1989 to market Soviet uranium and services in Germany, Switzerland, Austria, and The Netherlands. This relationship could give Cogema another source of supply, as well as a possible means of improved access to the newly opened east European marketplace.

Finally, there is UG's trading and brokerage activities, which may complement the business of Interuran, an established European uranium intermediary, 75-percent of which is owned by Cogema. How UG's and Interuran's businesses could or would be integrated has not been indicated by either company.

VEBA and Cogema have had previous joint business dealings, including a 1989 memorandum of understanding in which Cogema would hold a 51 percent share and VEBA, a 49-percent share of a joint venture that would operate the UP3 fuel reprocessing plant at LaHague, France. This established a relationship between Cogema and UG's parent that certainly provided improved channels of communication and negotiation. And the relationship probably helped this purchase agreement be well-received in both Germany and France. Once authorized, Cogema's purchase of UG will exemplify the continuing, and often dramatic, trend of consolidation within the uranium industry.

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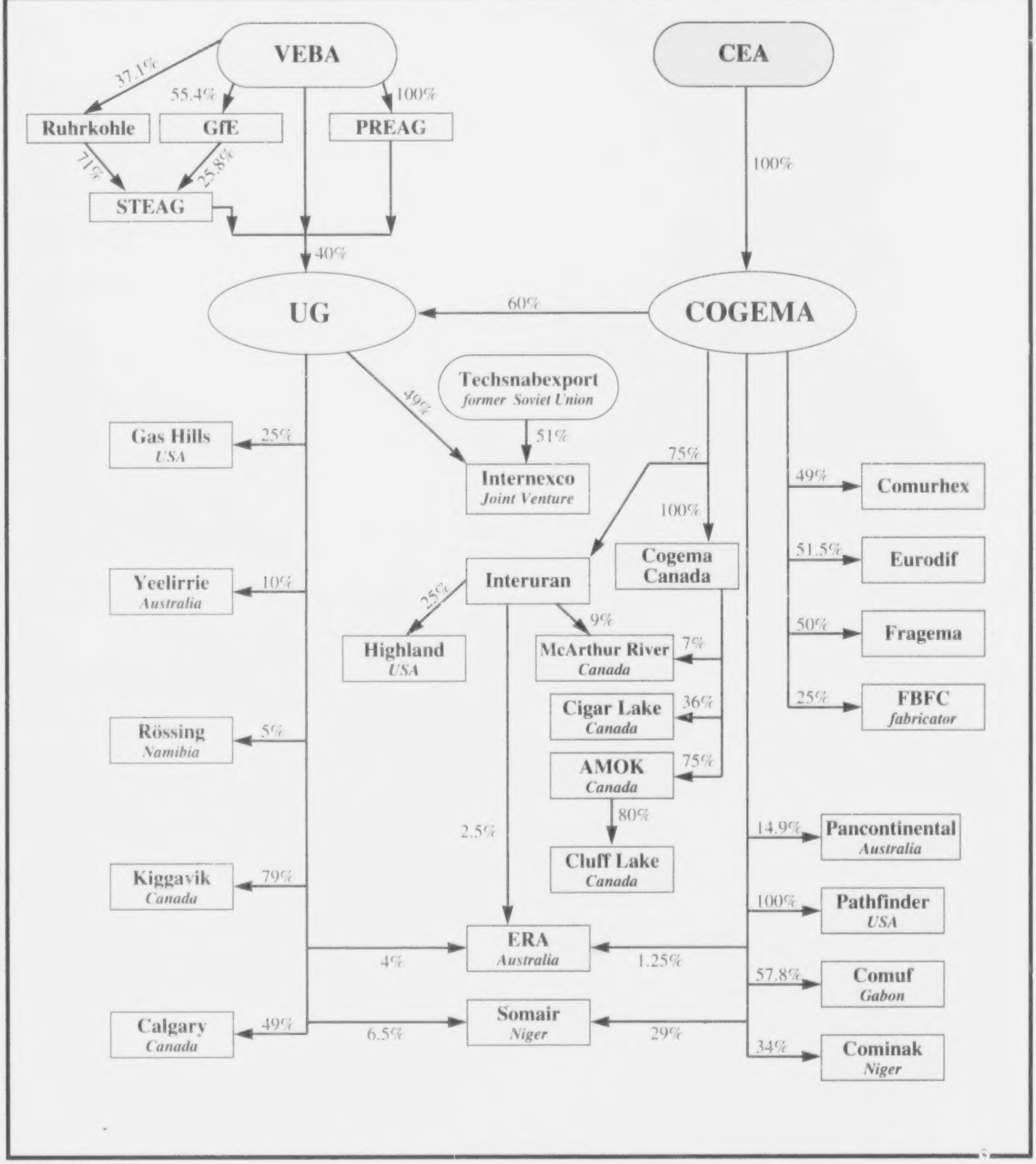
Figure 1
COGEMA–URANGESELLSCHAFT OWNERSHIP INTERESTS


VEBA
CEA
37.1%
55.4%
100%
Ruhrkohle
GfE
PREAG
71%
25.8%
STEAG
100%
40%
UG
60%
COGEMA
Techsnabexport
former Soviet Union
49%
51%
Gas Hills
USA
25%
Internexco
Joint Venture
75%
100%
49%
Comurhex
51.5%
Eurodif
Yeelirrie
Australia
10%
Interuran
Cogema
Canada
25%
9%
Highland
USA
McArthur River
Canada
7%
50%
Fragema
Cigar Lake
Canada
36%
25%
FBFC
fabricator
Rössing
Namibia
5%
AMOK
Canada
75%
80%
2.5%
Cluff Lake
Canada
14.9%
Pancontinental
Australia
Kiggavik
Canada
79%
100%
Pathfinder
USA
ERA
Australia
4%
1.25%
57.8%
Comuf
Gabon
Calgary
Canada
49%
6.5%
Somair
Niger
29%
34%
Cominak
Niger

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RECENT DEVELOPMENTS

SOUTH AFRICA

1991 Uranium Production

For the eighth consecutive year, uranium production in South Africa declined significantly. In 1991, total production from Chamber of Mines members dropped 34 percent from 1990's level, falling to 4.1 million pounds equivalent U_3O_8 (**Table 1**). Compared to each preceding quarter, production dropped 25 percent in the first quarter, increased 2.5 percent and 6.0 percent respectively in the second and third quarters, then dropped almost ten percent in the fourth quarter.

Of the nearly 2.1 million pound decrease for the year, over 570 thousand pounds (27 percent) can be attributed to the shutdown of Freegold (formerly the Free State Joint Metallurgical Scheme) and the East Rand Gold and Uranium Company (ERGO). Buffelsfontein production declined 291 thousand pounds from its 1990 level. The company announced in the third quarter that it would cease uranium production as soon as possible, and did so early in the fourth quarter. Hartebeestfontein also produced at lower levels throughout the year; its total was down 20 percent, to 579 thousand pounds. Production cuts at Vaal Reefs accounted for most of the remaining decrease. In the fourth quarter of 1990, Vaal Reefs announced that production at its west uranium plant was being cut by 50 percent and that production at its east plant had been suspended for at least three months or until market conditions improved. As a result, Vaal Reefs' 1991 production declined by 1.1 million pounds (55 percent of the total 1991 decrease), to 2.4 million pounds equivalent U_3O_8.

Of all of the uranium-producing members of South Africa's Chamber of Mines, only Western Areas showed an increase in production climbing ten percent in 1991, to 639 thousand pounds. The augmented output was the result of improved ore grade.

The year 1991 was historic for South Africa, as major steps were taken that advanced social and political reform and consequently resulted in the lifting of economic sanctions against South Africa by most countries. However, even though South African origin uranium became once again permissible in the world market, depressed market prices for uranium as well as gold has, in many cases, made production uneconomic. It is likely that the viability of uranium production in South Africa will continue to erode in 1992, for without improved market conditions, it will be difficult for South African uranium producers to regain their lost market share.

Table 1

SOUTH AFRICA 1991 URANIUM PRODUCTION[1]

(thousands of pounds U_3O_8)

Operation	TOTAL 1990	First Quarter 1991	Second Quarter 1991	Third Quarter 1991	Fourth Quarter 1991	TOTAL 1991	Percent Change[2]
Buffelsfontein	699	139	135	134	0	408	−41.6
ERGO[3]	213	3	0	5	0	8	−96.2
Freegold[4]	368	0	0	0	0	0	−100.0
Hartebeestfontein	725	139	142	142	156	579	−20.1
Vaal Reefs	3,575	555	588	633	659	2,434	−31.9
Western Areas	579	155	153	164	167	639	+10.4
TOTAL[5]	**6,159**	**992**	**1,017**	**1,078**	**982**	**4,069**	**−33.9**

[1] Excludes Palabora Mining Company, which is not a member of the Chamber of Mines.

[2] Change in percent from the 1990 totals.

[3] ERGO = East Rand Gold and Uranium Company Ltd.

[4] Formerly Free State Joint Metallurgical Scheme.

[5] Columns may not add up due to rounding.

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WASHINGTON FOCUS

by Linda L. Gunter

With several issues pending of interest to the nuclear fuel industry, Congress returned to the Capitol January 21 to complete the 102nd Congressional agenda. Congressional priorities this year, while tinged with partisan politics, include jobs, the economy, and passage of the FY1993 budget. Thus the debate on nuclear legislation must be framed in terms of the above issues in order to be considered by Congress. Since President Bush mentioned his energy strategy in the State of the Union address, there is a chance an energy bill will be approved by Congress as a bill that promotes US employment and helps the economy. Congressional consideration of other issues, such as legislation to move forward DOE's characterization of the Yucca Mountain site for a spent fuel repository or the bill restructuring DOE's uranium enrichment program, may depend on their inclusion in an omnibus energy bill.

Administration-Proposed FY1993 DOE Budget

◇ The President's budget was released on January 29, and the Department of Energy's budget request for FY1993 reflects the Administration's decision to shift priorities away from defense spending, while living within the previously agreed-to budget guidelines. DOE's total budget request grew two percent from FY1992, to $19.4 billion. Defense production spending declined, as did civilian energy programs, so that environmental cleanup programs could expand to $5.5 billion, an increase of $1.1 billion from FY1992. Funding for nuclear energy R&D programs would decrease from last year's $365. 8 million: the request for FY1993 is only $344.7 million. Although the uranium enrichment program appropriations request grew slightly, the amount spent on actual production of enrichment services declined from $1.214 billion in FY1992, to $1.174 billion requested for FY1993. The increased spending would come in the areas of waste management and environmental restoration where the funding request grew to approximately $217 million, almost double that of FY1992.

The issue of DOE's environmental cleanup, including decontamination and decommissioning (D&D) of the gaseous diffusion plants (GDP), is again addressed in the FY1993 budget. Still, the question of sharing these costs with the defense programs has yet to be addressed, according to William Young, Assistant Secretary for Nuclear Energy. In the budget proposal, DOE announced it intends to request a millage fee of 0.33/kWh from all civilian nuclear reactors to create a fund of $183 million to offset the costs of the cleanup. The agency will have to introduce separate legislation or promulgate a rule to create this fund from millage fees. Undoubtedly, before the mechanism to collect the fee is established, the utility industry will contest the imposition of another millage fee because they have no ability to control spending from this fund. They will protest, believing the fee to be unfair because it is imposed only on domestic customers of DOE and not on foreign customers, in spite of the fact that historically about a fourth of DOE's enrichment production has been sold internationally.

The Department quietly made another potentially controversial decision in the budget, choosing to request only $100 million for the AVLIS program. The intention is to do no more work on deployment activities, thus limiting the program to the status of a research project and making it even less likely that AVLIS will be built on a commercial scale. If Congress approves DOE's request, the result will be a $63.5 million cut from FY1992 funding levels.

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Energy Research and Development Subcommittee Hearing On AVLIS

◇ On January 28, Rep. Marilyn Lloyd's subcommittee on Energy Research and Development held a hearing on nuclear energy programs, including the status of AVLIS, at which both Martin Marietta Energy Systems and Lawrence Livermore National Laboratory testified. It was clear both witnesses knew cuts were proposed in the budget, since both pressed their case for increasing the AVLIS budget and moving forward with deployment activities. Dr. James Davis, Associate Director for Lasers at Livermore testified on two funding scenarios: a full-funding case at $191 million and a minimum funding case of $100 million. He said a budget of $100 million would result in "irretrievable loss of key staff and at least a year's delay in deployment if sufficient funding resumes in FY1994". He said these staff reductions of 40 percent would have to begin in the fourth quarter of FY1992 and that plant-scale demonstration of the integrated systems would not be possible. He also argued for private sector access to the technology via the Cooperative Research and Development Agreement (CRADA) program, which DOE refuses to authorize because of national security considerations. The subcommittee was sympathetic to the witnesses' requests for more money; however, as the committee is responsible for authorizing but not appropriating money, it remains unclear whether Congress will commit to funding AVLIS deployment.

USCEA Nuclear Fuel Supply Committee Meeting

◇ Over 110 industry representatives attended the USCEA's Nuclear Fuel Supply Committee meeting January 28. At the meeting, an announcement was made that the committee, now called the Nuclear Fuel Supply Forum, will study issues on an ad hoc basis, since previously-existing task forces have been disbanded. An additional new forum, created to discuss nuclear fuel regulatory issues, will interface with NUMARC and will consider issues such as user fees, NRC licensing of fuel cycle facilities, and NRC/EPA regulation of mill tailings.

The first panel of speakers discussed the prospects for Congressional action on legislation restructuring the uranium enrichment program to be administered as a private corporation. Two Congressional committee staffers, one from the House and one from the Senate, confirmed that the issues under debate have now shifted away from consideration of the new corporation's obligation to recover a large "debt" owed by the utilities to DOE. The new issues being debated are the cost and funding mechanism for environmental cleanup and D&D of the GDPs. Another issue that should be considered by the legislature is the fate of AVLIS and whether any entity, without access to this competitive technology after the year 2000, stands a chance of retaining its market share. Both speakers stated that utilities should be prepared to pay a millage fee as the funding mechanism for a D&D fund, unless a viable alternative is proposed to create a guaranteed source of revenue. Further, the staffers expressed doubt about the successful passage of the energy strategy bill.

Ron Stouffer of the General Accounting Office (GAO) described the agency's process for producing a report. The basic mission of the GAO is to perform program evaluations resulting from specific Congressional requests. Currently two reports of relevance to the fuel cycle industry are in process.

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The first, to be completed by April of this year, is a report for Senator Alan Simpson (R-WY) about the effect on the US market of uranium imports from the former Soviet Union. The second is a review of the D&D cost analysis performed by independent contractors and a study of mechanisms for funding D&D. The latter report is considering two specific questions: the fairest method of determining who pays for D&D, and the appropriate users to pay for the cleanup.

The afternoon session focused on trade issues. Daniel Webster, an attorney in private practice, gave a primer on the anti-dumping law. In his opinion, the utilities may participate in the process as "interested parties". Philip Contes of Newman & Holtzinger presented an update on the status of international trade issues. He noted the United States has concluded nuclear cooperation agreements with Hungary, the Czech and Slovak Federal Republic, and Poland, although none of the agreements has entered into force. The need to extend the US-Euratom agreement was also discussed. Finally, Congressional efforts to reauthorize the Export Administration Act (HR 3489 and S 320) were addressed. Although the Senate passed its bill early in 1991, House action was delayed until October. The two bills differ substantially, with the House bill containing many amendments that are objectionable to the Administration. Title III of the House bill, called the Nuclear Proliferation Control Act, requires stringent new standards for exports of nuclear fuel and technology, and provides for sanctions against individuals, companies, and countries that violate safeguards or export control licensing procedures. If Title III were to become law it could cause severe problems for international commercial nuclear fuel trade. As soon as the House appoints its members, a conference committee will convene to address the differences between the House and Senate versions of the bill.

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INDUSTRY BRIEFS

North Korea Signs Safeguards Accord

On January 30, North Korea's Vice Minister of Atomic Energy and Industry signed an International Atomic Energy Agency (IAEA) agreement permitting the IAEA to safeguard all nuclear facilities in the country. The agreement, also signed by IAEA Director General Hans Blix, had been awaited for years. North Korea signed the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) in 1985, but had not followed up its signing with any safeguards agreements. With France recently signing the NPT, China announcing its intent to sign as well, and the US removal of nuclear weapons from South Korea, North Korea finally signed the accord.

◆ ◆ ◆

EdF's 55th Reactor Goes Critical

Penly 2, the 1,310 MWe pressurized water reactor operated by Electricité de France, achieved criticality on January 10. EdF's 55th operational reactor is expected to reach commercial operation in June.

San Onofre 1 Likely to Close

Southern California Edison's (SCE) San Onofre 1 reactor likely will be shut down permanently within a year. The 24 year-old reactor will be closed at the end of its current fuel cycle, provided the California Public Utility Commission (CPUC) approves a recent agreement between the reactors' owners, SCE and San Diego Gas & Electric, and CPUC's Division of Ratepayer Advocates.

The 436-MWe (net) PWR will be closed primarily due to economics, as the plant has only a 53 percent lifetime capacity factor and is in need of $125 million in upgrades before its next refueling. The CPUC is expected to approve the agreement.

◆ ◆ ◆

Canadian AECB to Provide Training in Romania

The Atomic Energy Control Board (AECB) of Canada recently signed an agreement with Romania's National Commission for Nuclear Activities Control in which the AECB agreed to train Romanian nuclear regulators. The agreement is part of a larger cooperation effort to reestablish Romania's nuclear program and to complete its Cernavoda nuclear station. Ontario Hydro, Atomic Energy of Canada, Ltd., Nuclear Construction Managers of Montreal, and Italy's Ansaldo SpA are all involved in the effort. Unit 1, a 680-MW CANDU reactor, is about 50 percent complete and is now planned to reach criticality in late 1994.

Japanese Fuel Cycle Companies to Merge

Near the end of January, Japan's two major nuclear fuel cycle firms announced their intent to merge. Japan Nuclear Fuel Industries (JNFI), which handles uranium enrichment and low-level waste management, and Japan Nuclear Fuel Services (JNFS), which handles spent fuel reprocessing, will form an integrated fuel cycle company known as Japan Nuclear Fuel, Ltd. (JNFL) as of July 1.

JNFL will be headquartered in the city of Aomori, the capital of the prefecture in which Japan's major fuel cycle facility at Rokkashomura is located. When this complex is complete, JNFL will operate a 1.5 million SWU-per-year enrichment plant, a 200 thousand cubic meter low-level waste storage facility, and a 800 metric ton-per-year spent-fuel reprocessing center.

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ONTARIO HYDRO

Ontario Hydro is one of the largest electric utilities in North America. Created in 1906, this financially self-sustaining provincial corporation in Ontario, Canada, now operates 81 electricity generating stations with a total installed dependable peak capacity of 31,472 MWe. Hydro delivers power over an extensive transmission and distribution system to 314 municipal utilities, more than 100 large industrial consumers, and over 900 thousand customers in rural and remote areas. The total number of customers served by the utility throughout the province exceeds 3.6 million.

Ontario Hydro is also the largest nuclear utility in Canada, operating 18 nuclear power reactors with capacity totalling almost 13 thousand megawatts electric. Two more reactors are under construction and, when completed by 1993, will add over 1,700 MWe of net nuclear generating capacity. The company is separated into several branches as illustrated in **Figure 1**. The diagram has been simplified to show only the major branches and where nuclear operations fit in the organization. It should be noted that the current organization is effectively subdivided into two components. The planning, finance, and demand management branches report directly to the Chairman and Chief Executive Officer, whereas the design, construction, and operations branches report through the President and Chief Operating Officer.

ELECTRICITY GENERATION

Each year, Ontario Hydro delivers nearly 140 million megawatt-hours of electricity to its customers, with almost half of this power currently provided by Hydro's nuclear power stations. More than one quarter of the utility's total electricity (about 6,400 MWe of installed capacity) is generated by 68 hydroelectric power stations ranging in size from less than one megawatt to 1,200 MWe. Hydro's eight thermal stations (fueled by coal and oil) generate about twenty percent of the total. The balance of electricity supply (about ten percent) comes from electricity purchases made by Hydro, primarily from nearby provincial and US utilities.

Limited availability of acceptable sites for new hydroelectric installations, and environmental concern about the effects of additional fossil-fueled plants, have caused Ontario Hydro to focus on improving and upgrading existing hydroelectric stations. Many of the utility's stations are quite old (one dating back to 1906), so the utility has started a 20-year program to upgrade 33 of the hydroelectric stations. The program includes plans to install new turbines at several stations. Once the designated stations have been modified and upgraded, their total capacity will have been boosted by about 20 percent, and the improvements will permit Hydro to operate the plants for perhaps as much as 80 more years.

Hydro's thermal plants also are being improved, both to increase efficiency and to reduce pollution. Most plants have been switched to low-sulfur coal, and plans are underway to further reduce emissions by installing scrubbers in several stations.

NUCLEAR POWER PROGRAM

Ontario Hydro's first industrial-scale reactor, Pickering 1, reached commercial operation in 1971. Since that time, the utility has brought on line 17 more reactors, the latest of which, Darlington 1, reached full power in December 1991. Hydro's 18 reactors are located at five stations: Pickering A, 4 x 515 MWe; Pickering B, 4 x 516 MWe; Bruce A, 4 x 848 MWe; Bruce B, 4 x 860 MWe; and Darlington, 2 x 881 MWe (**Table 1**). Units 3 and 4 at Darlington are still under construction and are expected to reach commercial operation in 1992 and 1993, respectively.

Hydro's installed nuclear capacity of 12,718 MWe is composed exclusively of CANDU-type heavy water reactors. Developed by Atomic Energy of Canada, Ltd. (AECL) and Ontario Hydro, the CANDU reactor has proven to be one of the safest and most reliable reactor designs. The use of heavy water as a moderator precludes the need for enriched uranium fuel, a factor that makes this design favored in Canada, a country with world-class uranium resources.

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Figure 1
Ontario Hydro Organization

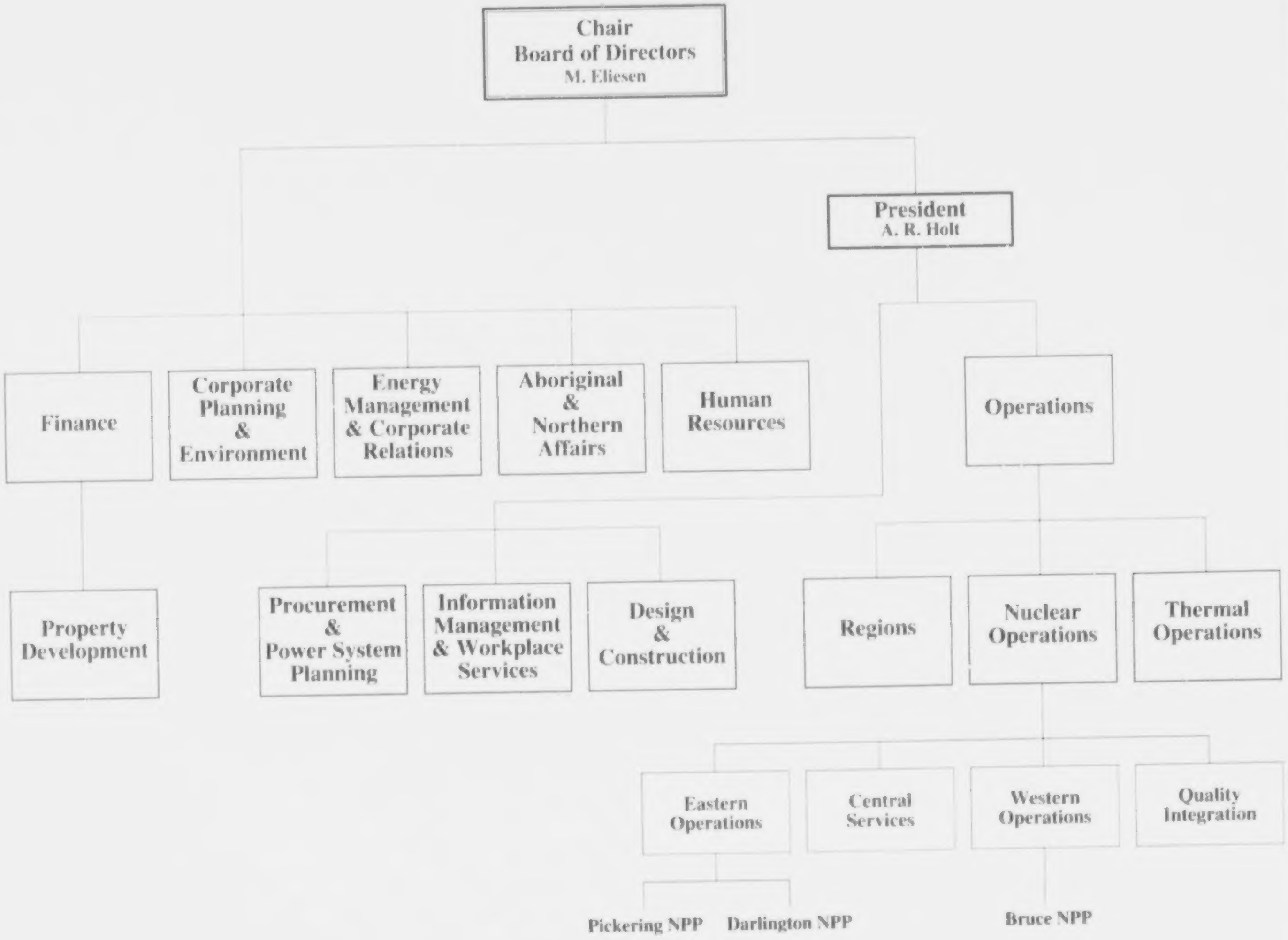
Chair
Board of Directors
M. Eliesen
President
A. R. Holt
Finance
Corporate Planning & Environment
Energy Management & Corporate Relations
Aboriginal & Northern Affairs
Human Resources
Operations
Property Development
Procurement & Power System Planning
Information Management & Workplace Services
Design & Construction
Regions
Nuclear Operations
Thermal Operations
Eastern Operations
Central Services
Western Operations
Quality Integration
Pickering NPP
Darlington NPP
Bruce NPP

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Table 1
NUCLEAR POWER UNITS OF ONTARIO HYDRO

Units In Operation

Unit	Lead Utility or Fuel Buyer	Capacity (MWe Net)	Type	COD[1]	1990 Capacity Factor (percent)	Total 1990 Electricity Generation (GWh Net)
Bruce 1	Ontario Hydro	848	HWR	1977	30	2,263
Bruce 2	Ontario Hydro	848	HWR	1977	34	2,558
Bruce 3	Ontario Hydro	848	HWR	1978	73	5,399
Bruce 4	Ontario Hydro	848	HWR	1979	48	3,564
Bruce 5	Ontario Hydro	860	HWR	1985	74	5,556
Bruce 6	Ontario Hydro	860	HWR	1984	85	6,235
Bruce 7	Ontario Hydro	860	HWR	1986	89	6,694
Bruce 8	Ontario Hydro	860	HWR	1987	79	5,788
Darlington 1	Ontario Hydro	881	HWR	1992	—	——
Darlington 2	Ontario Hydro	881	HWR	1991	—	1,183
Pickering 1	Ontario Hydro	515	HWR	1971	68	3,053
Pickering 2	Ontario Hydro	515	HWR	1971	65	2,937
Pickering 3	Ontario Hydro	515	HWR	1972	0	0
Pickering 4	Ontario Hydro	515	HWR	1973	24	1,080
Pickering 5	Ontario Hydro	516	HWR	1983	86	3,869
Pickering 6	Ontario Hydro	516	HWR	1984	76	3,455
Pickering 7	Ontario Hydro	516	HWR	1985	77	3,492
Pickering 8	Ontario Hydro	516	HWR	1986	67	3,013
TOTAL		**12,718**		*(1990 Average:*	**62)**[2]	**69,649**

Units Under Construction or Planned

Unit	Lead Utility or Fuel Buyer	Capacity (MWe Net)	Type	COD[1]	Percent Complete[3]
Darlington 3	Ontario Hydro	881	HWR	1992	97
Darlington 4	Ontario Hydro	881	HWR	1993	80
TOTAL		**1,762**			

[1] COD = Commercial Operation Date (actual or expected)

[2] Source: *Ontario Hydro*

[3] Source: *Nuclear News (as of 12-31-91)*

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Historically, Ontario Hydro's reactors have operated very well, several having lifetime capacity factors exceeding 80 percent. Performance gradually declined from an average capacity factor for all reactors of 84 percent in 1983, to 62 percent in 1990. This decline was partly attributable to a few reactors being down for retubing, and reduced performance by those reactors still in need of retubing. However, as Hydro's retubing program is carried out and rehabilitation efforts are completed, capacity factors at those older stations are expected to return to around 80 percent. Pickering units 1, 2, and 3 (**Figure 2**) have all been retubed, and unit 4 is currently shut down until 1993 for the modification. Bruce 1 and 2 are scheduled for retubing beginning in 1994 and 1997, respectively. Also, a program was launched in mid-1991 to rehabilitate Bruce Units 1 through 4 over the next eight years at an estimated cost of C$854 million. The rehabilitation is part of Ontario Hydro's long-term objective to maximize the operating performance of its nuclear plants. As recent output figures illustrate, the efforts are beginning to pay off: the average capacity factors at Hydro's stations climbed to 69 percent for 1991. Only fuel problems at the Darlington station weighed down the total average.

In late 1990, investigation into a refueling problem at Darlington 2 revealed damage to some fuel bundles. Consequently, Unit 2 was shut down in January 1991 for a more detailed examination and analysis of the problem. Unit 1, which had achieved full power in the same month, was shutdown in March 1991 to carry out planned commissioning tests and to await the resolution of the problem in Darlington 2. The cause of the problem proved evasive, and only recently have experts from Ontario Hydro,

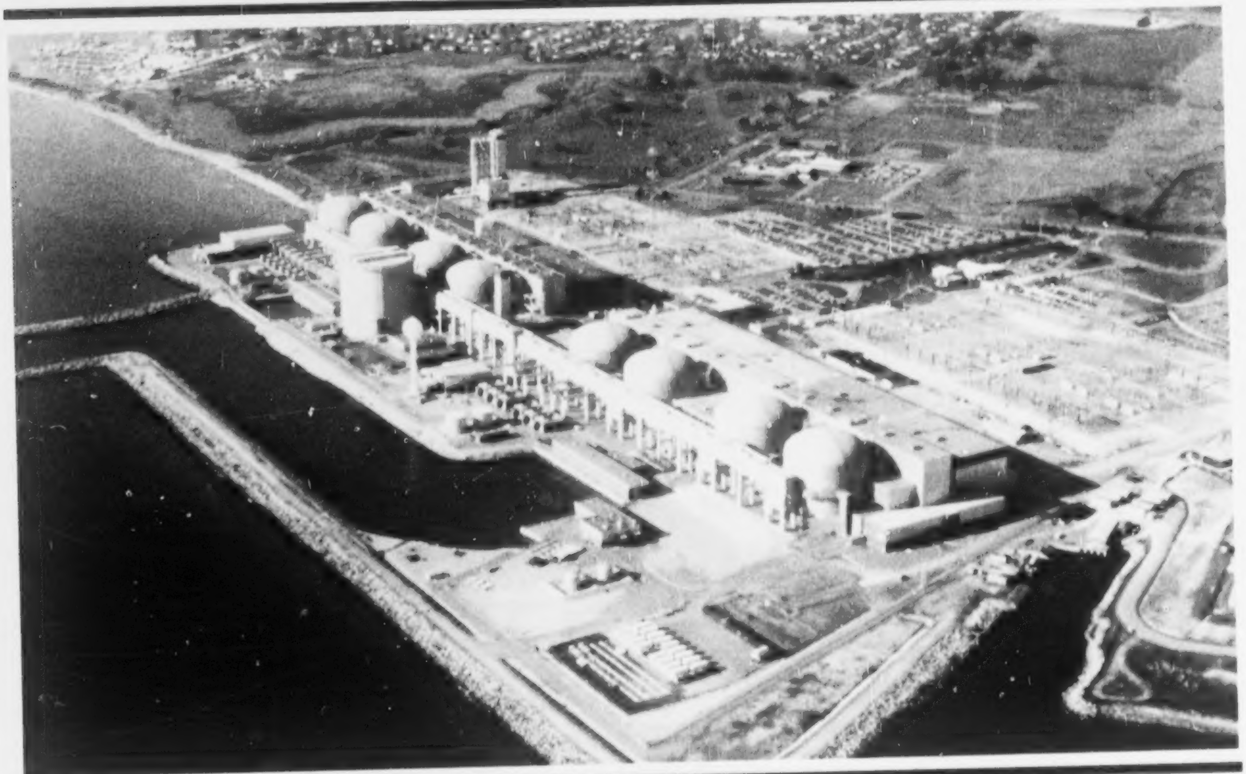

Figure 2 — Pickering Nuclear Power Station consists of eight 515-MWe Candu-Type heavy water reactors, located 30 kilometers east of Toronto.

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AECL, and General Electric Canada been able to tentatively identify the cause. It is believed that with the current configuration of the primary heat transport system in the Darlington reactors, the five-blade impellers in the primary cooling pumps create a resonant frequency that produce vibrations leading to erosion and fatigue damage of the fuel bundles. The engineers believe the problem can be solved, retrofits made, and the unit restarted in the second half of this year. Meanwhile, Darlington 1 was restarted in early December 1991 and reached full power by year end.

FUEL CYCLE SERVICES

Ontario Hydro purchases its uranium fuel domestically through long-term contracts with producers in Ontario and Saskatchewan. The utility's supply from Saskatchewan is extracted from the high-grade Key Lake deposit under agreements with Cameco Corporation and Uranerz Exploration and Mining Ltd. Historically, the majority of Hydro's supply has come from two producers at Elliot Lake, Ontario: Denison Mines, Ltd. and Rio Algom, Ltd.

Due to the high cost of this uranium and because contracts with both companies were approaching a period where they could be cancelled, Hydro notified Denison in April 1991 that it would terminate its supply contract for over three million pounds of uranium per year, effective January 11, 1993. Since Ontario Hydro had become Denison's sole customer for its Elliot Lake production, and Denison subsequently stated its production costs at Elliot Lake were not competitive in the current world market, the company announced the closure of its Elliot Lake operations once deliveries to Ontario Hydro are completed in May 1992. In anticipation of its closing, Denison included undepreciated fixed assets in the cost of its uranium, and asked Hydro to pay C$215.64 per pound U_3O_8 (US$184) for upcoming deliveries. Hydro refused and recently filed a claim with the Ontario courts to clarify its supply agreement with Denison. Hydro has been paying about C$70 per pound (US$60) for Elliot Lake uranium, which over the past ten years represents more than C$1 billion in payments in excess of market price.

During the spring of 1991, Ontario Hydro began to consider cancelling its contract with Rio Algom in order to purchase cheaper uranium elsewhere. However, in June 1991, the newly elected socialist New Democratic Party (NDP) government in Ontario directed Hydro, through an Order-in-Council, to participate in a government program known as the Elliot Lake Regional Economic Development Program. As a result, Ontario Hydro and Rio Algom agreed to revise the termination date of Hydro's long-term contract with Rio Algom. Under an economic obsolescence clause, the utility could have cancelled deliveries after 1993. However, deliveries now will continue through mid-1996, and the quantities will be increased. Hydro will still pay the original contract's cost-plus, above-market price for the 3.7 million pounds equivalent U_3O_8 to be delivered from now to mid-1993. The utility will pay a lower price for an additional 5.9 million pounds above the original contract quantity. Nonetheless, the premium above the anticipated market price for the extra material delivered in the period 1991-1996 will amount to C$160 million, or C$27 per pound U_3O_8 above market price. According to the government directive, Ontario Hydro must pay an additional C$90 million as a contribution to the Elliot Lake economy. The total subsidy amounts to C$250 million.

The reduced level of long-term uranium purchasing from the Elliot Lake region will change the major suppliers to Ontario Hydro. Purchases from Saskatchewan producers will likely increase and potentially become the principal suppliers to Hydro. However, Hydro will seek to broaden its supply base and may diversify its sources to other than Canadian suppliers.

Ontario Hydro has its concentrates refined and converted by Cameco. Cameco's Blind River, Ontario, facility (**Figure 3**) refines the concentrates to UO_3 and transports the material to its Port Hope conversion plant where it is transformed into unenriched, ceramic-grade UO_2 powder for utilization in CANDU reactor fuel. This UO_2 powder is then fabricated into fuel bundles by Ontario Hydro's two fuel manufacturers: General Electric Canada, Ltd. at Peterborough, Ontario, and Zircatec Precision Industries, Inc. at Port Hope. Ontario Hydro's reactors use two different fuel designs: 28-element fuel bundles at the Pickering station, and 37-element bundles at Bruce and Darlington. Hydro has its fabrication supply under contract through 1992.

Heavy water has been produced for Hydro's reactors in the utility's separation plants on the Bruce peninsula. Bruce heavy water plants, HWP-A and -B started up in 1973 and 1979, respectively, and both had a rated capacity of

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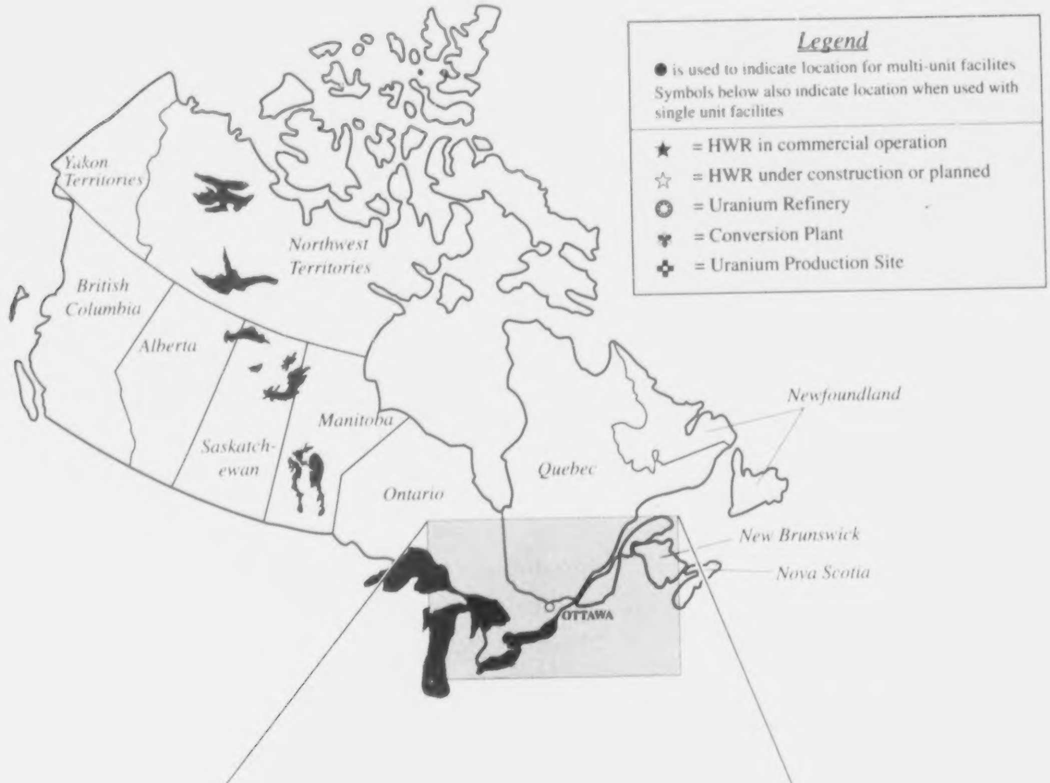
Figure 3
NUCLEAR POWER UNITS AND FUEL CYCLE FACILITIES IN ONTARIO


Legend
● is used to indicate location for multi-unit facilites
Symbols below also indicate location when used with single unit facilites
★ = HWR in commercial operation
☆ = HWR under construction or planned
= Uranium Refinery
= Conversion Plant
= Uranium Production Site
Yukon Territories
Northwest Territories
British Columbia
Alberta
Saskatchewan
Manitoba
Ontario
Quebec
Newfoundland
New Brunswick
Nova Scotia
OTTAWA
Quebec
Ontario
New Brunswick
Fredericton
Montreal
OTTAWA
Elliot Lake
Blind River
Peterborough
Toronto
Port Hope
Darlington ★★☆☆
Bruce ★★★★ ★★★★
Windsor
Pickering ★★★★ ★★★★

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700 MT D_2O per year. Bruce HWP-A shut down in the early 1980s, but Bruce HWP-B continues to operate at full capacity. Since, after its initial load, a typical CANDU reactor only requires five metric tons of heavy water per year to replace losses, the capacity at HWP-B is sufficient to meet current needs as well as anticipated future growth. AECL's heavy water plants at Port Hawkebury and Glace Bay once supplied the moderator and coolant to Ontario Hydro, but those plants were shut down in the early 1980s.

Ontario Hydro also has a tritium removal facility at Darlington that began operating in August 1990. The plant can process over 150 thousand gallons of heavy water per month, reducing the moderator's tritium content to 0.5 curies per liter and producing purified tritium, a substance much in demand for fusion research, development, and industrial processes. The tritium extraction process has already led to a reduction in radiation exposure of workers at Hydro's nuclear stations by as much as 36 percent.

Canada does not yet have any permanent spent fuel disposal facility. Officials from AECL Research, the federal government corporation responsible for developing a Canadian deep underground geological repository for high-level nuclear waste, has indicated that it likely will be several years before all the necessary regulatory and environmental approvals have been obtained to permit the long-term disposal of spent nuclear fuel. AECL Research estimates that some twenty years will elapse before an approved facility is designed, sited, and constructed.

As a result, Ontario Hydro has decided to retain its spent fuel on site and has designed a dry storage facility for this purpose. The new storage system uses monitored retrievable storage (MRS) technology, and Hydro already has begun marketing the system to other countries and individual utilities worldwide. On-site dry storage facilities are particularly attractive for Ontario Hydro because the CANDU fuel bundles are compact, have low burnup, and relatively small residual heat compared to light water reactors' enriched fuel. In January 1992, Hydro's Board of Directors approved a C$60 million expenditure for the first phase of the dry-storage project where 6,200 metric tons of spent fuel from Hydro's Pickering reactors will be stored during the period 1994-2007. A later, second phase could handle an additional 7,000 MT while a national disposal facility is being established.

THE NDP AND ONTARIO HYDRO'S DEMAND/SUPPLY PLAN

On September 6, 1990, the socialist New Democratic Party surprised many observers by winning the majority of seats in Ontario's provincial election. The NDP, led by Premier Bob Rae, had long espoused a strong anti-nuclear platform and began to exercise its influence soon after it took office. One of the NDP's first moves was to place a moratorium on construction of any new nuclear facilities, although construction on the Darlington nuclear station was allowed to continue. The declared moratorium also stopped advanced reactor research and cancelled engineering and development work on Hydro's long-term reactor plans.

Table 2
1989 ONTARIO HYDRO DEMAND/SUPPLY PLAN[1]
(Data for Median Demand Growth-GWe)

	January of:			
	1999	**2004**	**2009**	**2014**
Basic Load Forecast	30.2	34.5	37.0	39.8
Demand Management	3.4	4.5	5.2	5.9
Firm Load Forecast	26.8	30.0	31.8	33.9
Load Meeting Capability				
Existing System	25.5	25.0	22.8	18.5
Purchases	0.2	0.8	0.8	0.8
Hydroelectric	0.9	1.5	1.8	2.2
Non-Utility Generation	0.6	0.9	1.1	1.2
Load Meeting Capability w/o Major Additions	27.2	28.2	26.5	22.7
Required Major Additions to Load Meeting Capability[2]	0	1.8	5.3	11.2

[1] Source: Figure ES-1 of the 1989 Demand/Supply Plan [extracted from *Unecan News*, vol. 2, no. 1, January 31, 1992, p.2]

[2] The generating capacity additions must exceed load meeting capability requirements by 24 percent in order to maintain Ontario Hydro's reserve margin.

In mid-1991, Premier Rae named Marc Eliesen as Chairman and Chief Executive Officer of Ontario Hydro. Mr. Eliesen had been Ontario's Deputy Minister of Energy and was Chairman of Manitoba Hydro when the NDP was in power in that province. Mr. Eliesen has been a long-time NDP supporter and maintains a neutral stance on the nuclear issue.

At the end of 1989, prior to the election of the NDP, Ontario Hydro completed its 25-year Demand/Supply Plan for meeting the electricity needs of the province through the year 2014. The original plan called for conservation and efficiency improvements totalling 5,500 MWe, new hydroelectric facilities and natural gas-fired plants, increased purchases from non-utility generators (independent power producers) and from neighboring Canadian and US utilities, and a substantial increase of installed nuclear generating capacity. Hydro's plans called for ten additional 881-MWe (net) CANDU reactors at three stations by 2014. These proposals were based on a conservative demand growth estimate of 2.2 percent per year, and an expectation that more than 8,500 MWe of fossil and nuclear generating capacity would have to be retired by 2014 due to obsolescence. **Table 2** gives the basic forecast data of the original plan.

The plan was submitted to Ontario's majority Liberal government in December 1989 for approval. The government appointed a three-person Environmental Assessment Board (EAB) to assess the plan. A funding subpanel was established by the EAB in 1990 to consider intervenors' requests for financial support from Ontario Hydro. The outcome was that Hydro was directed to provide C$23 million to intervenor groups, most of whom will use the money to fund challenges to Hydro's long-term energy plans.

The first formal hearing of the EAB took place in April 1991. For the past nine months, the Board has been engaged in the early stages of an investigation that had been expected to extend for another two to three years. However, the scope of the hearings has been modified significantly (**Table 3**) following the presentation by Hydro to the EAB on January 15, 1992, of a revised plan, referred to as the 1992 Update. The updated plan will forego the commitment to any new fossil or nuclear generating plants until after the turn of the century, and instead, will rely upon independent power producers, conservation, and other demand-side management measures to meet reduced forecast load growth.

Specifics of the amended plan include doubling the spending on demand-side management to C$6 billion over ten years, doubling purchases of power generated by private producers, and continuing the earlier intention to build a C$2 billion transmission line to import as much as 1,000 MWe of hydroelectric power from Manitoba. A comparison of the two plans is shown in **Table 4**. The original expansion plans calling for the ten new reactors has been deferred (**Table 5**): plans to build new nuclear or fossil-fueled capacity will be reconsidered later for possible operation in 2009.

Table 3
APPROVALS REQUESTED FROM ONTARIO ENVIRONMENTAL ASSESSMENT BOARD

1992 Updated Plan:

a) **1,000 MW** power transmission line from Manitoba
b) **up to 1,800 MW** of additional hydroelectric capacity

1989 Original Plan:

a) **1,000 MW** power transmission line from Manitoba
b) **2,010 MW** of additional hydroelectric capacity
c) **1,344 MW**:two combustion turbine units (CTU) at 672 MW each
d) **2,016 MW** capacity through CTU/IGCC units
(Integrated Gasification Combined Cycle)
e) **1,008 MW** natural gas or oil CTU/CC.
f) **3,534 MWe**-CANDU A reactors
g) **3,524 MWe**-CANDU B reactors
(equivalent of two, four-unit stations)

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Table 4
ONTARIO HYDRO 25-YEAR DEMAND/SUPPLY PLAN

Original Plan (released December 1989)	**Updated Plan** (released January 1992)
Demand growth estimates yielded the need for over 11.2 GWe of additional generating capacity by 2014.	Demand forecasts were reduced during the mid- to late 1990s, thereby cutting new capacity requirements to only 0.2 GWe.
This plan forecast the need for ten additional 881-MWe CANDU heavy water reactors at three stations by 2014.	Plans for construction of new nuclear plants were eliminated; any decision about when or if to build additional nuclear capacity was deferred until after the turn of century.
The hydroelectric portion of the plan called for over 2,800 MWe of additional capacity at as many as 18 sites, including new installations, redevelopments, and extensions.	Hydroelectric additions were cut by more than 1,000 MW. Plans for six new installations and two extensions have been suspended, resulting in reduced capacity additions of up to 1,800 MW.
The original plan called for numerous fossil-fueled plants totalling almost 5,400 MW of capacity additions. The plants included coal, gas, and oil-fired combustion turbine units, with most intended as combined cycle or integrated gasification plants.	The update cut all plans for new fossil-fueled units. It deferred 4,300 MW of new supply beyond 2014, and will rely upon reduced demand, hydroelectric additions, and plant life extensions to meet forecasts.
The 1989 forecast determined that over 8,600 MW of capacity would need to be retired before 2014.	The 1992 update required fewer plant retirements, now totalling only 4,400 MW. Life extensions are planned for some fossil-fueled plants, but not for any nuclear plants.
Demand management was projected to save over 5,500 MW of capacity by 2014.	The new plan would rely upon demand management to save nearly 9,900 MW of capacity. Of this, almost 4,000 MW would be "saved" through fuel switching.* The budget for demand management of the updated plan would be doubled, to C$6 billion over ten years.
To access additional power, a power transmission line to import 1,000 MW per year from Manitoba would be installed by the year 2000.	The Update retained this portion of the plan to install a new transmission line to import power from Manitoba.
Over 2,100 MW of power would be purchased from Non-Utility Generators (NUG).	The revised plan outlined very rapid growth of non-utility generators. Thus, the utility will rely on NUGs for purchases of 4,200 MW.
It took five years to prepare the original plan and to carefully analyze and review every scenario such that a high degree of confidence could be placed on the forecasts.	The updated plan mandated by the NDP was compiled in less than one year to reflect NDP policies. Many events could significantly affect the new forecasts, so progress on demand management and other factors must be watched carefully and reacted to quickly to avoid possible supply shortages.

* Fuel switching is being encouraged by Ontario Hydro as a policy to save electricity. The procedure would provide financial incentives to consumers to switch to other forms of energy; for example, from electric heat to gas heat. In order for this policy to be implemented legally, the Power Corporation Act must be amended and those amendments approved by the legislature. This issue has become very political and much opposition to the proposed amendments exists in the Ontario legislature. However, since the NDP has a majority of seats, the passage of the new legislation seems likely.

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Table 5
COMPARISON OF 1989 PLAN AND 1992 UPDATE CAPACITY TARGETS FOR 2014
(Megawatts electric)

	Original 1989 Plan		1992 Update	
	Additional Required	**To Be Retired**	**Additional Required**	**To Be Retired**
Demand Management	5,570	—	9,860*	—
Non-Utility Generators	2,120	—	4,200	—
Manitoba Purchase	1,000	—	1,000	—
Hydroelectric	2,849	—	up to 1,800	—
Fossil Fuels	5,376	6,654	[6,000 combined]	2,366
Nuclear	8,810	2,060		2,060
Total	**25,725**	**8,714**	**22,860**	**4,426**

* Nearly 4,000 MW of this gain is expected through fuel switching.

OUTLOOK

The policies of the NDP government have dramatically changed the outlook for Ontario Hydro. Original plans had nuclear power eventually generating well over half of all electricity supply for the province. Instead, no new plants are being considered once the Darlington station is completed, and electricity needs will be met by reducing demand, not increasing supply. As Premier Bob Rae stated, "Frankly, the next few years are going to be the test as to whether we can get the demand forecasts down."

This cutback in new construction requirements has led Ontario Hydro and its reactor supplier, AECL, to look internationally for other opportunities. Both have found success, as AECL is supplying systems and technical expertise to South Korea as Korea Electric Power Corporation builds a second CANDU unit at Wolsong and has requested offers for the supply of units 3 and 4. Ontario Hydro has been successful in developing cooperation agreements and providing training to Romania, which is in the process of completing four heavy water, CANDU-type reactors at Cernavoda. Hydro and AECL also have signed an agreement in Hungary to examine the feasibility of building four CANDU reactors at the Paks station. These successes and a concerted effort with Canada's federal government to develop other international opportunities will provide business to Ontario Hydro while it works domestically to manage demand growth.

Many doubt that demand management can realistically outpace demand growth. Numerous groups in Ontario, typified by the Association of Major Power Consumers, have expressed outrage at the NDP's ideological power policies, labeling them "short-term political thinking" and "a tragedy for Ontario."

Ontario Hydro was established by the Power Corporation Act, which mandates that Hydro provide power at cost to all customers. Several changes to the Act are required in order for the new updated demand/supply plan favored by the NDP to be legally enacted and legitimately pursued. This process is the next step for the new plan, in what has become a tangled political debate. Several municipal utilities, major power customers, the nuclear industry, and labor leaders recently testified before a legislative committee considering proposed amendments to the Act incorporating the new NDP policies. The groups all contended that the suggested new legislation was unwise, unrealistic, and not based on economic facts.

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Even if the NDP is voted out of power in the next election expected in 1995, or if the party realizes that demand is growing faster than conservation efforts to reduce it and thus modifies its policies, Ontario Hydro will have lost several crucial years that could have been spent planning for additional capacity. Higher-than-expected demand can consume overcapacity in only a few years, and a shortfall of generating capacity is intolerable to customers suffering blackouts or brownouts. And, without new plants under construction, it can take a decade or more to return to a position of having surplus economic generating capacity. Clearly, Ontario Hydro has challenges facing it, but the utility has demonstrated through past performance it can overcome its obstacles and will remain one of the important nuclear utilities of the world.

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EURATOM IN A NEW EUROPE

As the European Community (EC) approaches its thirty-fifth anniversary, it faces new challenges in opening markets to competition during a period of recession in the West. The degree to which the EC emphasizes protectionism rather than open competition in world markets will have a profound effect on international trade.

In the nuclear fuel market, the EC faces a dilemma as the new nations of the former Soviet Union seek markets in the West for those few products they can sell profitably, while some EC producers seek protection for their existing customer base. The EURATOM Supply Agency, which was established to ensure the equitable and reliable supply of nuclear fuel within the EC, is struggling to address this issue while Europe is rapidly changing.

Treaty Background

Three treaties were signed establishing the European Communities, the first in Paris on April 18, 1951, and the other two in Rome on March 5, 1957. The European Coal and Steel Community, the original union of Belgium, France, West Germany, Italy, Luxembourg, and the Netherlands, preceded the European Economic Community (EEC) and the European Atomic Energy Community (EURATOM) by six years. All of the treaties have the same member states as signatories; thus the three communities are commonly referred to singularly as the EC. The size of the EC has doubled since 1957, and there are now twelve Member States: Belgium, Denmark, France, Germany, Great Britain, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain.

Article 1 of the EURATOM Treaty states that each Member State shall

> ...contribute to the raising of the standard of living in the Member States and to the development of relations with the other countries by creating the conditions necessary for the speedy establishment and growth of nuclear industries.

The EC government, headquartered in Brussels, Belgium, is then charged under Article 2 to do the following:

> *(a)* promote research and ensure the dissemination of technical information;
>
> *(b)* establish uniform safety standards to protect the health of workers and of the general public and ensure that they are applied;
>
> *(c)* facilitate investment and ensure, particularly by encouraging ventures on the part of undertakings, the establishment of the basic installations necessary for the development of nuclear energy in the EC;
>
> *(d)* ensure that all users in the EC receive a regular and equitable supply of ores and nuclear fuels;
>
> *(e)* make certain, by appropriate supervision, that nuclear materials are not diverted to purposes other than those for which they are intended;
>
> *(f)* exercise the right of ownership conferred upon it with respect to special fissile materials;
>
> *(g)* ensure wide commercial outlets and access to the best technical facilities by the creation of a common market in specialized materials and equipment, by the free movement of capital for investment in the field of nuclear energy and by freedom of employment for specialists within the EC;
>
> *(h)* establish with other countries and international organizations such relationships as will foster progress in the peaceful uses of nuclear energy.

The problem of nuclear fuel supply is addressed in detail in Chapter VI of the Treaty, entitled "Supplies." Article 52, item 2.b of the chapter provides for the creation of the EURATOM Supply Agency:

> An Agency is hereby established; it shall have a right of option on ores, source materials and special fissile materials produced in the territory of Member States and an exclusive right to conclude contracts relating to the supply of ores, source materials and special fissile materials coming from inside the EC or from outside.

Customarily, the Supply Agency's exclusive right to conclude contracts is maintained through provision

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of a clause in contracts which reads, "This Agreement is concluded with the concurrence of the EURATOM Supply Agency," and is followed by the signature of an Agency official. The Agency's involvement in the contract normally does not extend past providing such concurrence.

Since the emergence of the commercial uranium market in the 1970s, the Supply Agency is not known to have exercised its "option" on nuclear fuel of Community origin (presumably to buy or sell it), nor has it influenced the distribution of supplies among EC companies to any notable degree. An unusual situation does exist in the relationship between EURATOM and the US Department of Energy (DOE). The Supply Agency is the contract holder and administrator of all EC nuclear fuel business with DOE, which means that notices to and from EC companies pass through Brussels *en route* to and from DOE. The Agency has controlled the disposition within the Community of some quantities of DOE-origin, high-enriched uranium (HEU), as supplies of HEU are relatively scarce.

Although the Agency has not intervened to buy or sell, it has closely monitored proposed exports of Community-origin uranium and enrichment services, particularly in recent years. By contrast, it has shown little concern with exports of, for example, US or Soviet-origin materials from the EC. The Agency's apparent objective in discriminating on the basis of origin has been to ensure that EC consumers receive priority for the acquisition of Community-origin materials, thereby keeping EC products within the EC whenever possible.

As noted above in Article 2.d, the Agency is also charged under the Treaty with ensuring that EC consumers receive a regular and equitable fuel supply. In 1957, when the Treaty was signed and uranium was believed to be relatively scarce, the signatories intended that the Agency would protect EC consumers against discrimination in the distribution of nuclear fuel. As uranium is known today to be relatively abundant, the fears of the Treaty signatories have been shown to be unfounded, and one of the main purposes for establishing the Agency could be considered obsolete. The Agency now appears to interpret its mission as the preservation of a diverse supply base for the Community and the assurance of prices that are considered equitable or fair to EC producers.

Role of Politics

To better define its mission, the Agency has looked to the European Commission for direction. The Commission is the executive body of the EC, composed of seventeen commissioners appointed by the Member States, two each from the five largest Member States and one each from the seven remaining members. Each commissioner has the responsibility for a separate portfolio or set of portfolios, such as Energy or Agriculture. Reporting directly to the commissioners are twenty-two director generals, who are the most senior civil servants in the EC bureaucracy. Most of the director-generalships in the EC are comparable to ministries in a Member State government and, in that sense, the EURATOM Supply Agency is unique; with a staff of about twenty-five persons, it is the smallest administrative unit in the EC bureaucracy to have a director-generalship.

The Director General of the EURATOM Supply Agency is Michael Goppel of Germany. He reports directly to the commissioner for Energy, Antonio Cardoso e Cunha of Portugal. Both Mr. Cardoso and Mr. Goppel assumed their positions January 1, 1989. Under Mr. Goppel, the senior administrator of the Agency is Jean-Claude Blanquart from France. An advisory committee, comprised of officials from EC companies active in the nuclear fuel market, assists the Supply Agency on a consultative basis.

As the European Commission is a political body, and the Supply Agency is closely connected to the European Commission, the Agency's practices may be heavily influenced by EC politics at any point in time.

The influence of politics has been particularly notable in recent years. During most of the 1980s, the nuclear fuel industry largely perceived the Agency as an administrative office that registered contracts and maintained relations with some outside governments, particularly Australia, Canada, and the USA. In 1988, however, the Agency had a direct commercial impact when it reviewed the practice of swapping safeguards obligations on equivalent quantities of uranium at different locations (flag swapping). Flag swaps had previously been conducted routinely by the EURATOM Safeguards Directorate in Luxembourg at the request of EC companies.

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The Agency's actions inhibiting flag swaps, as well as a related *de facto* policy restricting material swaps of Southern African uranium, caused it to be viewed as obstructive by some EC companies. Flag swaps promote the fungibility of uranium within the EC's internal market, and are therefore a mechanism the Agency theoretically should support.

The Agency attributes the 1988 policy restricting swaps to directives from the Commission. The commissioner for Energy at that time, Nicolas Mosar of Luxembourg, apparently faced a barrage of questions from members of the European Parliament after the publication in the German news magazine *Der Spiegel* of allegations that the Supply Agency had acted wrongly in consenting to flag swaps and allowing free trade in South African uranium. The Commission denied the press allegations, but the Agency was affected by the political fallout. After meetings with Mr. Mosar and officials of the director-generalship for Energy (DG17), the Agency changed its guidelines for swaps and for contract review in general.

During 1989, the discussion about flag swaps and swaps involving South African and Namibian uranium subsided, and a far-reaching discussion arose about EC trade policy in general. After the dramatic revolutions in eastern Europe began in 1989, that discussion intensified.

Most of the countries of eastern Europe and the former Soviet Union aspire to have close commercial ties with the EC, and many of them are major suppliers of nuclear fuel. However, EC companies that fear a loss of market share from increased deliveries of non-EC nuclear fuel to EC end-users have sought protection from imports. In return, commissioners have asked the Agency and DG17 to consider the situation of the EC producers of uranium, conversion, and enrichment.

Diversity of Supplies

The Supply Agency publishes an Annual Report containing statistics on the number and type of contracts concluded by the Agency and other information about supplies of uranium, conversion, and enrichment to and from the EC in the previous calendar year. The Agency's Annual Report for 1990 includes the following statement:

> During 1990, as in previous years, the front-end of the nuclear fuel cycle in the European Communities has continued to operate satisfactorily.
>
> A well diversified supply of nuclear materials and services was readily available. Ongoing supply under existing contracts did not pose any particular problems and increasing favorable terms have been obtained by buyers in newly concluded contracts...The EC is...dependent on external supplies of natural uranium for some three quarters of its requirements...1990 saw the first significant acquisitions of Soviet origin natural uranium by EC utilities—around nine percent of the EC's 1990 requirements—much in the form of UF_6. Consequently, besides being a displacement from the EC's traditional natural uranium supply sources, such transactions have resulted in an associated loss of business for the EC's conversion industries.

Regarding enrichment services, the Report further stated:

> Although the potential availability of substantial quantities of low-priced separative work from the Soviet Union continued to be widely published, purchases from this source during 1990 by EC entities were negligible. Transactions centered rather on enriched uranium product held in excess utility and government inventories. A significant proportion of the material thus traded was subsequently exported.

In keeping with the Agency's policy of confidentiality, the Report should not normally provide statistics on the origins of material or the quantities delivered to particular Member States or companies, although there is a specific reference in the Report to Soviet-origin supplies. The Supply Agency does monitor the quantities of material imported from various supplier nations. Furthermore, persons within the Agency may have particular views as to the proper balance of supply sources for the EC, although no *official* target limits have been declared or published. The determination of acceptable "reasonable limits", or quotas, of fuel from a particular non-EC source is clearly a subjective process. Thus, while Canadian uranium may have accounted for nearly thirty percent of total EC uranium supply in certain past years without any apparent concern in Brussels, imports from the former Soviet Union equivalent to nine percent in 1990 warranted a cautionary

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note in the Agency's Report. Similarly, while SWU deliveries to the EC from the USDOE accounted for more than half of EC deliveries in the 1970s, the threat of an increase in imports from the former Soviet Union —currently around ten percent of EC supplies—also warranted a concerned commentary in the Agency's Report.

In view of the Agency's commitment to ensuring a diverse supply base for the Community, its reaction to the growth in market share of a new supplier seems inconsistent. However, the response might be explained by examining the second element of the Agency's perceived mission—the assurance of prices that are considered equitable or fair to EC producers. Although the quantity of material imported from the former Soviet Union has been relatively small, many EC producers have been unable or unwilling to compete at current world market levels for several years. If EC suppliers were competing effectively with suppliers from the former Soviet Union, the Agency's reaction might have been different.

EC-USSR Trade Treaty

On December 17, 1989, the EC signed a treaty with the Soviet Union on trade, and commercial and economic cooperation. The Trade Treaty covers trade in all goods, except textiles, coal, and steel. The Treaty contains a statement in Article 7 that is indicative of the character of the agreement:

> ...each Contracting Party shall accord the highest possible degree of liberalization to imports of the other's products.

While the intent of the Trade Treaty is clear, the Supply Agency has called attention to Article 14, which reads:

> Goods shall be treated between the Contracting Parties at market-related prices.

Outside of Article 14, there is no other use or definition in the Trade Treaty of the term "market-related prices". The Agency has recently declined to sign several agreements involving supplies originating in the former Soviet Union because of uncertainty about the meaning of "market-related prices." While most companies worldwide would agree that "market-related prices" refers to competitive prices available on a world market governed by supply and demand, the Agency has suggested that the term may be better defined as the *cost of production* using Western methods of evaluation. This suggestion would seem to contradict Article 67 of the EURATOM Treaty, which reads:

> Save where exceptions are provided in this Treaty, prices shall be determined *as a result of balancing supply against demand** as provided in Article 60; the national regulations of the Member States shall not contravene such provisions. [Article 60 addresses the requirement for users and producers in Member States to report their nuclear fuel demand and supply, respectively.]
>
> * authors' emphasis

To settle the debate, the Agency has convened officials from several EC companies, including producers, converters, enrichers, and utilities, to recommend a suitable interpretation for "market-related prices". The committees formed by these officials are expected to render an interpretation within the next few months.

The Agency's reluctance to approve new contracts involving deliveries from the former Soviet Union, even if temporary, corresponds in time with the anti-dumping proceedings against Soviet nuclear fuel imports in the USA. It is well known that several of the US producers funding the anti-dumping case in the USA are owned in whole or in part by EC producers.

Interestingly, the Treaty establishing the European Economic Community does have a provision pertaining to dumping in Part III, Title 1, Chapter 1, Section 2, Article 91, which reads as follows:

> *1.* If....the Commission, on application by a Member State or by any other interested party, finds that dumping is being practiced within the common market, it shall address recommendations to the persons with whom such practices originate for the purpose of putting an end to them.
>
> Should the practices continue, the Commission shall authorize the injured Member State to take protective measures, the conditions and details of which the Commission shall determine.

It is not clear that the clause is intended to apply to external trading nations. As yet, no Member State is known to have applied for a dumping investigation, nor has such a charge been addressed to any of the newly independent states within the former Soviet Union.

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Adapting to a New Europe

Ultimately, the decision within the EC whether to uphold restrictions against imports from the former Soviet Union will depend on Community politics. There is reason to believe that the Supply Agency's apparent stance against these newly independent states will not be sustained. After all, the production industries form only part of the European Community's nuclear fuel interests. Many EC utilities have become frustrated by the Agency's decision not to sign certain contracts, and by the effectiveness of the producers' solicitations. The consumers' views will eventually be heard.

Furthermore, the EC has a strong interest in helping, rather than hindering, the industries of eastern Europe and the former Soviet Union. Those emerging nations share a continent and heritage with the Member States of the EC, but they are vastly disadvantaged economically. Assisting them is the only means to create a peaceful new order in Europe.

James J. Lightner
Alan L. Wolcott

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NUCLEAR INDUSTRY CALENDAR

1992

Feb. 23-25 ***INFO Centers Workshop*** (Marriott Hotel, Palm Beach Gardens, Florida).
Sponsored by the U.S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

March 22-25 ***Fuel Cycle Conference '92*** (OMNI Charleston Hotel, Charleston, South Carolina).
Sponsored by the U.S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

April 8-10 ***Research and Development in the Nuclear Industry*** (Peterhouse, University of Cambridge, England).
Sponsored by the Institution of Nuclear Engineers and the British Nuclear Forum.
Contact: Ms. Ipek Yigit, Manager for Public and Industrial Affairs, British Nuclear Forum; phone: 071-828-0116; Fax: 071-828-0110; Address: 22 Buckingham Gate, London, SW1E 6LB, England.

April 8-10 ***25th Japan Atomic Industrial Forum Conference*** (Pacifico Yokohama, Yokohama, Japan).
Contact: Department of Planning and International Affairs, Japan Atomic Industrial Forum, Inc.; 81-3-3508-2411; Fax: 81-3-3508-2094; Address: 1-1-13 Shimbashi, Minato-ku, Tokyo 105, Japan.

April 12-16 ***8th Pacific Basin Conference*** (Taipei, Taiwan).
Sponsored by the Amercian Nuclear Society.
Contact: ANS Meetings Department; 708-352-6611.

April 26-28 ***INFO '92 Conference*** (OMNI Charlotte Hotel, Charlotte, North Carolina).
Sponsored by the U.S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

May 5-7 ***Annual Meeting on Nuclear Technology '92*** (City Conference Hall, Karlsruhe, Germany).
Sponsored by the German Nuclear Society and the German Atomic Forum.
Contact: Congress Office JK'92; INFORUM GmbH, Heussallee 10, W-5300 Bonn 1; Phone: 0228-507-223.

May 15-17 ***19th Annual Meeting & Int'l Conference on Nuclear Energy*** (Hotel Diplomat, Prague, Czech.).
Sponsored by World Nuclear Fuel Market.
Contact: Donna Cason; 404-447-1144; Fax: 404-447-1797.

June 7-11 ***American Nuclear Society Annual Meeting*** (Boston Marriott, Copley Place, Boston, Massachusetts).
Contact: ANS Meetings Department; 708-352-6611.

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1992
(continued)

Sept. 9-11 *Uranium Institute Seventeenth Annual Symposium* (London, United Kingdom).
Contact: 44-71-225-0303; Fax: 44-71-225-0308.

Sept. 20-23 *International Uranium Seminar '92* (Hyatt Regency Hotel, Lake Tahoe, Nevada).
Sponsored by the U.S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

Sept. 21-23 *Second International Conference on Training for Operation & Maintenance in the Nuclear Industry*
(The Moat House International Hotel, Stratford-upon-Avon, United Kingdom).
Sponsored by the Institution of Nuclear Engineers.
Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.

Sept. 29-Oct. 1 *Crisis/Emergency Information Planners' Workshop* (Loews L'Enfant Plaza, Washington DC)
Sponsored by the U.S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

Oct. 18-22 *AMC Mining Convention* (Las Vegas, Nevada)
Sponsored by the American Mining Congress
Contact: AMC Convention Office; 202-861-2800; Fax: 202-861-7535.

Oct. 19-23 *International Symposium on Geological Disposal of Spent Fuel, High-level and Alpha-bearing Wastes*
(Antwerp, Belgium).
Sponsored by the International Atomic Energy Agency.
Contact: IAEA, P. O. Box 100, A-1400 Vienna, Austria.

Nov. 15-18 *Nuclear Energy Forum* (Fairmont Hotel, Chicago, Illinois).
Sponsored by the U.S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

Nov. 15-20 *American Nuclear Society Winter Meeting* (McCormick Center Hotel, Chicago, Illinois)
Contact: ANS Meetings Department; 708-352-6611.

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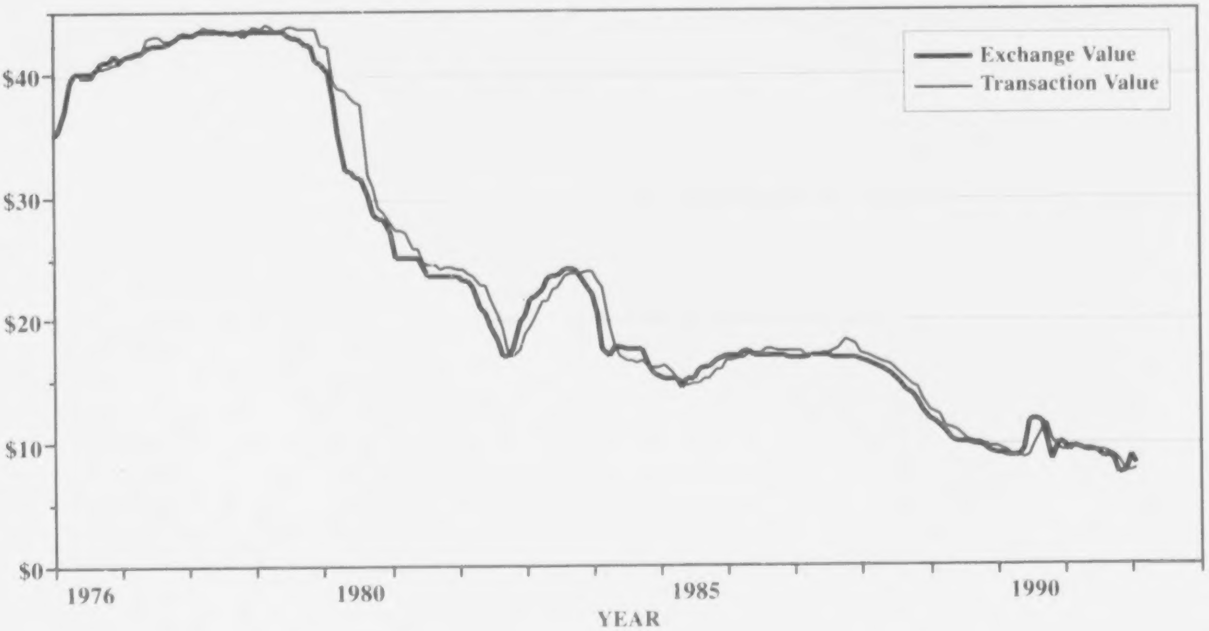
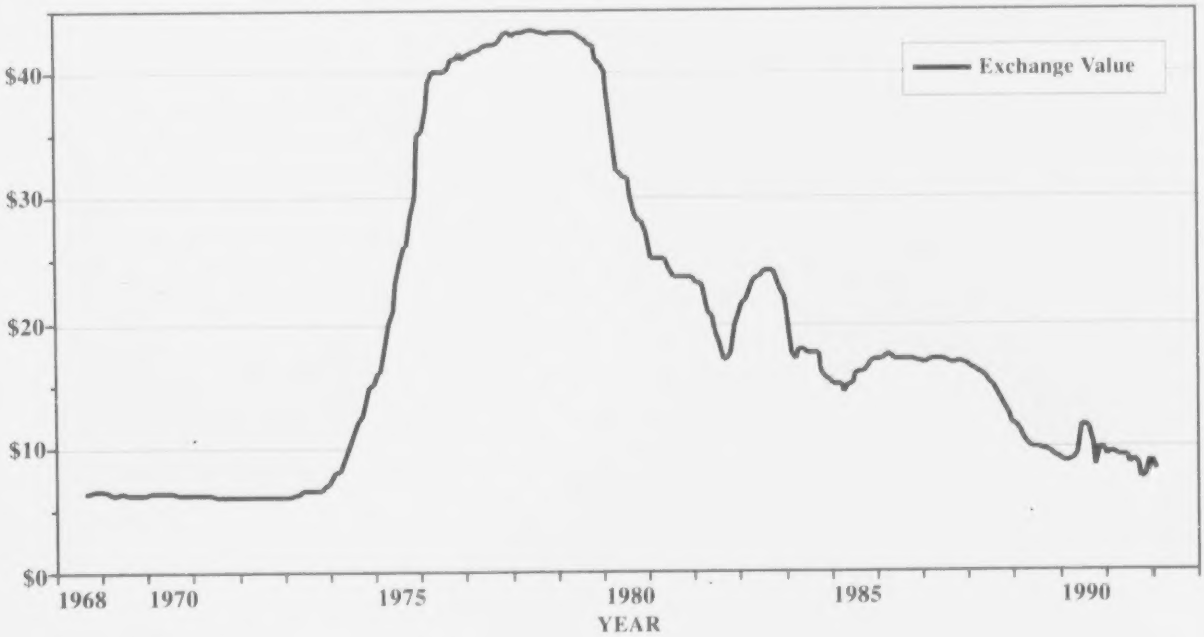
NUEXCO HISTORICAL EXCHANGE VALUE AND TRANSACTION VALUE

(in US dollars per pound U_3O_8)





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HISTORICAL MARKET VALUES

Exchange Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	9.80	9.70
1991	9.10	9.50	9.30	9.10	9.20	9.05	8.55	8.75	8.40	7.25	7.40	8.75
1992	**8.00**											

US Premium (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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UF$_6$ Values

Determined as of the last day of the month indicated (\$US/kg U as UF$_6$)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29.50	24.75	28.75	28.75
1991	27.50	27.75	27.50	27.25	27.60	27.25	25.75	26.25	25.50	22.75	22.75	26.00
1992	**24.50**											

US Premium (Relative to the UF$_6$ Value)

Determined as of the last day of the month indicated (\$US/kg U as UF$_6$)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

Conversion Values

Determined as of the last day of the month indicated (\$US/lb U as UF$_6$)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
1991	1.45	1.45	1.45	1.45	1.50	1.50	1.50	1.60	1.55	1.55	1.55	1.55
1992	**1.60**											

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Transaction Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.5[illegible]	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	9.30	9.15
1991	9.40	9.45	9.35	9.30	9.30	9.20	9.15	8.95	8.70	8.35	7.45	7.50
1992	**7.55**											

SWU Values

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	51	51
1991	51	50	52	52	54	59	66	67	67	68	68	70
1992	**71**											

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Loan Rates

Determined as of the last day of the month indicated (Percent per Annum)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1991	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.00
1992	**3.00**											

* Float with Prime Rate

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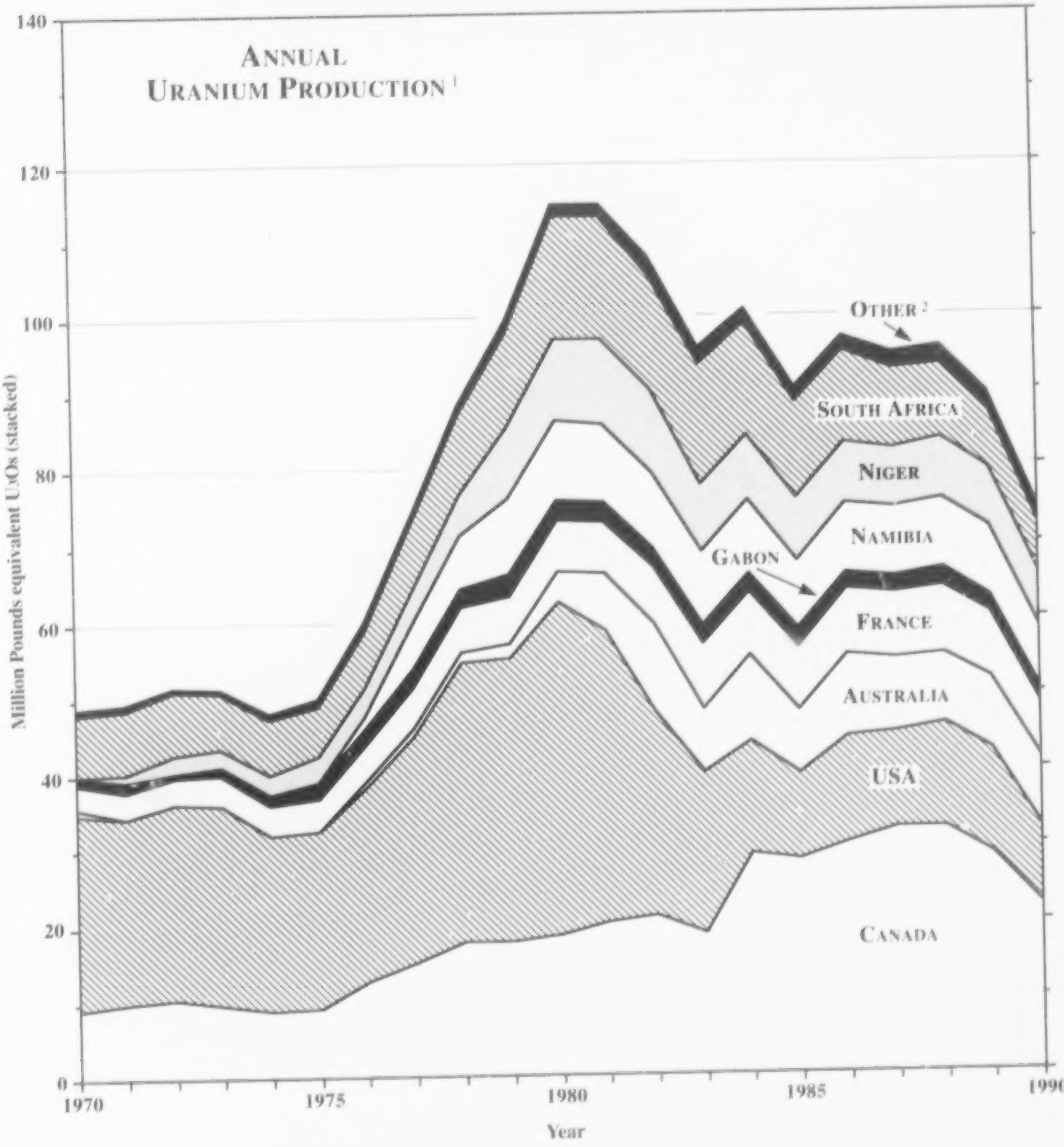

ANNUAL URANIUM PRODUCTION [1]

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[1] Estimated world uranium production in 1990 totalled 74.5 million pounds equivalent U_3O_8 —
(Australia: 9.1 – Canada: 22.0 – France: 7.4 – Gabon: 1.8 – Namibia: 8.0 – Niger: 7.4 – South Africa: 6.4 – USA: 10.2 – Other [2]: 2.2)

[2] **Other** includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, western Germany, and Yugoslavia

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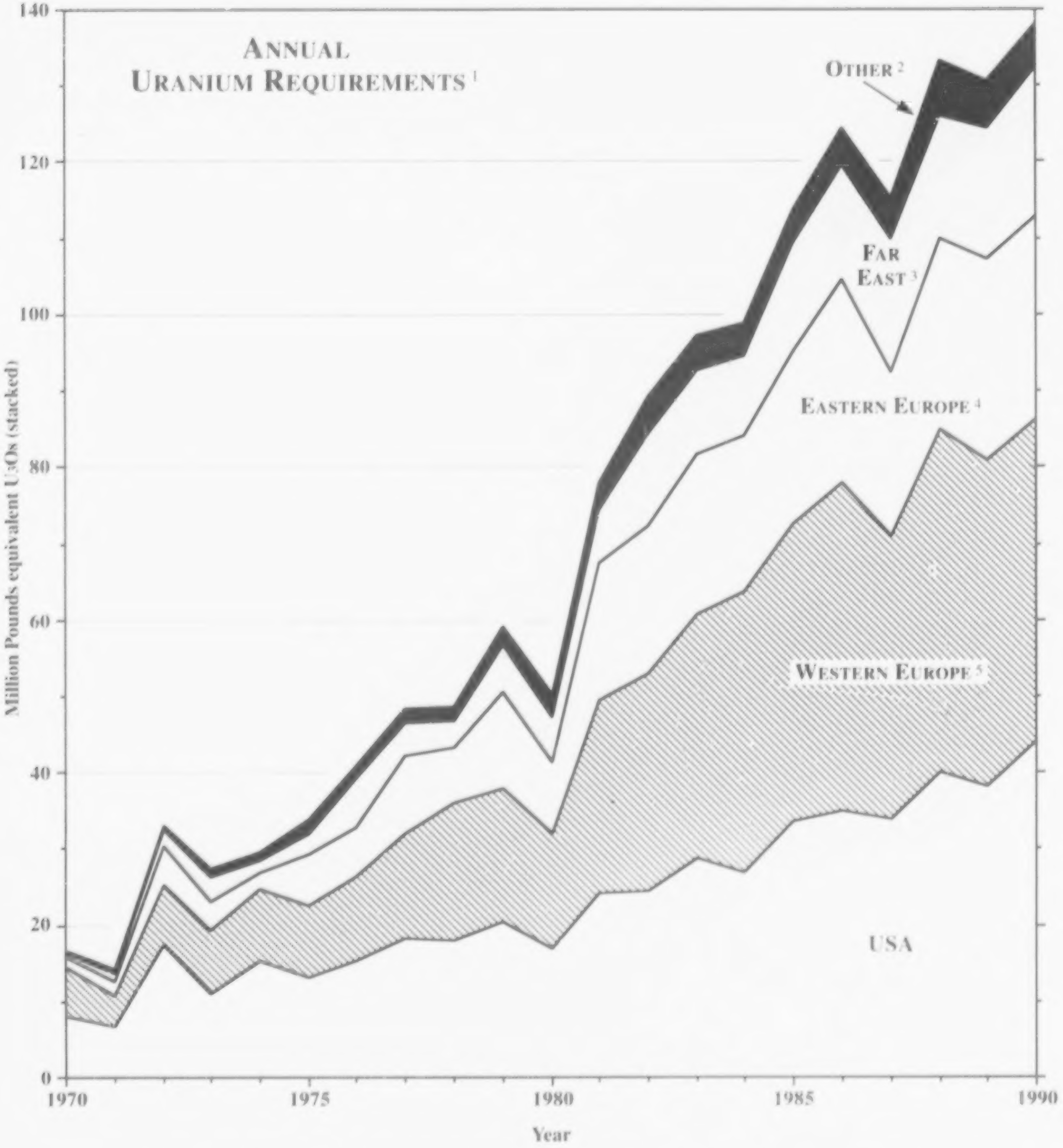

[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assay.

[2] **Other** includes: Argentina, Brazil, Canada, India, Mexico, Pakistan, and South Africa.

[3] **Far East** includes: Japan, People's Republic of China, South Korea, and Taiwan.

[4] **Eastern Europe** includes: Bulgaria, Czechoslovakia, E. Germany, Finland, Hungary, USSR, and Yugoslavia.

[5] **Western Europe** includes: Belgium, France, W. Germany, Italy, The Netherlands, Spain, Sweden, Switzerland, and UK.

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Australia

Year	Period[1]	Consumer Price Index[2] (1980/1981 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia[4] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[5] (June 1985=100)
1980	Avg.	95.8	83.1	—	69.6
1981	Avg.	105.0	85.9	—	76.1
1982	Avg.	116.7	89.0	—	86.4
1983	Avg.	128.5	96.9	—	89.9
1984	Avg.	133.6	98.0	—	96.0
1985	Avg.	142.6	107.3	—	100.0
1986	Avg.	155.5	101.5	—	104.9
1987	Avg.	168.7	108.9	465.88	112.9
1988	Avg.	180.9	111.8	496.90	115.4
1989	Avg.	194.6	117.0	534.65	126.0
1990	Avg.	208.7	123.4	571.43	129.7
Jan	1991	—	125.6	—	130.9
Feb	1991	—	121.5	597.70	130.9
Mar	1991	214.1	119.1	—	131.2 **R**
Apr	1991	—	117.6	—	131.4 **R**
May	1991	—	117.8	592.00	131.4 **R**
June	1991	214.4	120.4	—	131.4 **R**
July	1991	—	120.4	—	131.4 **R**
Aug	1991	—	119.9	599.50	131.7
Sept	1991	215.7	118.3	—	132.0 **R**
Oct	1991	—	118.7	—	132.0
Nov	1991	—	120.6	—	132.0
Dec	1991	217.7	—	—	—

P = Preliminary **R** = Revised since last month

[1] Monthly data for the period 1967 to 1990 appears in Report 278.

[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1980 to June 1981 = 100.0). Figures shown at end of quarter represent quarterly average.

[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0).

[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (Catalogue No. 6312.0). Figures for the latest fourteen months shown are subject to revision.

[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (Catalogue No. 6302.0).

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Canada

				Wage-earner Data: Average Hourly Earnings (C$)[4]				
		Industrial Products Price Index: All Commodities[1] (1986 = 100)[2]	**Consumer Price Index: All Items (1986 = 100)[3]**	**Uranium Mines (SIC 057)**	**Metal Mines (SIC 051-059)**	**Mines, Quarries and Oil Wells (SIC 051-099)**	**Metal Rolling, Casting and Extruding (SIC 298)**	**Chemicals and Chemical Products Industries (SIC 372-379)**
1980	Avg.	75.9	67.2	—.—	—.—	—.—	—.—	—.—
1981	Avg.	83.6	75.5	—.—	—.—	—.—	—.—	—.—
1982	Avg.	89.0	83.7	—.—	—.—	—.—	—.—	—.—
1983	Avg.	92.1	88.5	17.22	14.86	14.18	10.67	11.09
1984	Avg.	96.3	92.4	17.89	15.85	14.97	11.11	11.68
1985	Avg.	99.0	96.0	18.53	16.47	15.56	11.85	12.12
1986	Avg.	100.0	100.0	19.38	16.70	15.76	12.28	12.58
1987	Avg.	102.8	104.4	20.12	17.15	16.11	12.58	13.20
1988	Avg.	107.2	108.6	20.91	18.51	16.95	13.17	13.77
1989	Avg.	109.4	114.0	21.97	20.02	18.41	13.71	14.16
1990	Avg.	109.7	119.4	22.90	20.93	19.12	14.62	15.28
Jan	1991	111.1	125.0	23.79	21.79	19.78	14.66	15.89
Feb	1991	110.6	125.0	25.23	22.45	20.13	14.63	16.10
Mar	1991	109.8	125.5	24.19	22.22	20.27	15.21	16.47
Apr	1991	109.1	125.5	24.77	22.50	20.31	14.63	16.64
May	1991	108.6	126.1	24.38	22.17	20.25	15.05	16.55
June	1991	108.5	126.7	23.58	22.13	19.90	14.65	16.51
July	1991	108.2	126.8	24.70	22.33	19.93	14.56	16.36
Aug	1991	107.8	126.9	23.78	22.01	20.00	14.62	16.24
Sept	1991	107.6	126.7	24.23	22.27	20.38	14.89	16.47
Oct	1991	107.6	126.5	24.40 **R**	22.26 **R**	20.53 **R**	15.06	16.55 **R**
Nov	1991	107.5	127.0	24.57 **P**	22.40 **P**	20.91 **P**	14.87 **P**	16.66 **P**
Dec	1991	107.6	126.4	—.—	—.—	—.—	—.—	—.—

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1990 is found in Report 278.

[2] New Base Year of 1986 as of Report 266. Previous Base Year was 1981.

[3] New Base Year of 1986 as of Report 264. Previous Base Year was 1981.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1990 is found in Report 278.

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South Africa

		Average Declared Working Costs per Metric Ton of Gold Ore Milled[1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled[2] (March 1982 = 100)	Consumer Price Index[3] (1990 = 100)	Production Price Index All Groups[4] (1985 = 100)	Total Employment in Mining and Quarrying[5]	Total Salaries and Wages in Mining and Quarrying[5] (1,000 Rand)
							Annual Total[6]
1980	Avg.	35.50	—	25.5	55.2	709,042	2,237,689
1981	Avg.	41.87	—	29.4	62.7	722,918	2,756,928
1982	Avg.	47.23	103.9	33.7	71.4	702,041	3,181,584
1983	Avg.	51.88	115.0	37.8	79.0	700,901	3,563,282
1984	Avg.	58.95	130.3	42.2	85.6	711,511	4,134,390
1985	Avg.	68.70	151.7	49.1	100.0	724,587	4,778,612
1986	Avg.	80.18	177.9	58.2	119.6	756,637	5,767,950
1987	Avg.	95.01	223.1	67.6	136.2	751,864	6,911,395
1988	Avg.	106.69	241.1	76.2	154.1	705,355	7,774,054
1989	Avg.	116.65	273.0	87.4	177.5	700,360	8,833,934
1990	Avg.	129.37	305.3	100.0	198.9	677,742	10,193,209
							Monthly Total
Jan	1991	—	—	107.7	216.1	648,944	935,839
Feb	1991	—	—	109.0	216.9	650,948	893,373
Mar	1991	137.66	323.82	110.0	215.3	651,843	924,930
Apr	1991	—	—	111.5	216.5	639,939	887,722
May	1991	—	—	113.2	218.4	630,481	887,107
June	1991	134.65	317.23	114.0	219.3	640,908	890,595
July	1991	—	—	115.5	221.2	637,581	881,182
Aug	1991	—	—	117.1	222.8	613,704	934,308
Sept	1991	137.11	329.05	118.7	225.2	624,450	993,251
Oct	1991	—	—	119.8	228.3	—	—
Nov	1991	—	—	122.2	229.4	—	—
Dec	1991	134.81	327.83	123.8	—	—	—

P = Preliminary **R** = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in Report 278.

[2] Page 16 of Report 178 contains description and calculation of index.

[3] Central Statistical Service, Pretoria: All income groups-weighted average. Historical Data by month appears in Report 278.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in Report 236.

[6] Annual total is shown, rather than monthly average, for indicated year.

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GOVERNMENT STATISTICS

United States

		Producer Price Index[1]				Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
		Industrial Commodities (1982 = 100)	All Commodities (1982 = 100)	Consumer Price Index[2] (1982-1984 = 100)	GNP Implicit Price Deflator[3] (1982 = 100)	Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
1980	Avg.	88.0	89.8	82.4	85.7	10.26	10.63	8.31	6.94
1981	Avg.	97.4	98.0	90.9	94.0	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	100.0	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	103.9	12.58	13.43	10.58	8.66
1984	Avg.	103.3	103.7	103.9	107.7	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	110.9	13.38	13.74	11.57	9.46
1986	Avg.	100.0	100.2	109.6	113.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	117.7	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	121.3	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	126.3	13.59	13.72	13.09	10.05
1990	Avg.	115.8	116.3	130.7	131.5	14.10	14.36	13.54	10.32
Jan	1991	119.3	119.0	134.6	—	14.73	14.63	13.85	10.60
Feb	1991	117.2	117.2	134.8	—	14.80	14.55	13.81	10.59
Mar	1991	115.6	116.1	135.0	134.8	14.93	14.55	13.85	10.55
Apr	1991	115.6	116.0	135.2	—	14.85	14.56	13.96	10.63
May	1991	116.1	116.5	135.6	—	14.79	14.52	14.01	10.66
June	1991	116.1	116.4	136.0	136.1	14.88	14.51	14.05	10.74
July	1991	116.0	116.1	136.2	—	15.09	14.56	14.16	10.77
Aug	1991	116.3 **R**	116.2	136.6	—	14.82	14.64	14.06	10.78
Sept	1991	116.2	116.0	137.2	136.9	15.04	14.59	14.21	10.84
Oct	1991	116.6	116.4	137.4	—	14.94 **R**	14.75 **R**	14.25	10.78 **R**
Nov	1991	116.7	116.4	137.8	—	15.21 **P**	14.92 **P**	14.31 **R**	10.87 **R**
Dec	1991	116.1	115.9	137.9	—	—.—	—.—	14.37 **P**	10.95 **P**

P = Preliminary **R** = Revised since last month

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[1] US Bureau of Labor Statistics, Washington, DC: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents Historical data is presented in Report 278.

[2] US Bureau of Labor Statistics, Washington, DC: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in Report 278.

[3] US Department of Commerce, Washington, DC: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted. Historical data is presented in Report 278.

[4] US Bureau of Labor Statistics, Washington, DC: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in Report 278.

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Volume and Price of Uranium Deliveries To The European Community[1]

— Compiled from data published by the Euratom Supply Agency —

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price		Spot Contracts[3] Average Price	
			in ECU per pound U_3O_8	in US Dollars per pound U_3O_8	in ECU per pound U_3O_8	in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19
1990	12,800	16.7	ECU 23.08	$29.39	ECU 7.60	$ 9.68

P = Preliminary   R = Revised since last month

[1] The twelve European Community member nations are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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US Uranium Marketing Activities Statistics

— Compiled from data published by the US Energy Information Administration [1] —

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers [2] (million pounds U_3O_8)	Average Price of Delivered Uranium [2] (\$/lb. U_3O_8)	Quantity of Uranium Imported [3] (million pounds U_3O_8)	Average Price of Imported Uranium (\$/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	\$16.10	3.6	n/a	1.2
1977	29.9	27.8	\$19.75	5.6	n/a	4.0
1978	37.0	31.6	\$21.60	5.2	n/a	6.8
1979	37.5	33.0	\$23.85	3.0	n/a	6.2
1980	43.7	35.0	\$28.15	3.6	\$43.10	5.8
1981	38.5	32.6	\$34.65	6.6	\$32.90	4.4
1982	26.9	23.5	\$38.37	17.1	\$25.19	6.2
1983	21.2	24.2	\$38.21	8.2	\$26.16	3.3
1984	14.9	22.5	\$32.65	12.5	\$21.86	2.2
1985	11.3	21.7	\$31.43	11.7	\$20.08	5.3
1986	13.5	18.9	\$30.01	13.5	\$20.07	1.6
1987	13.0	20.8	\$27.37	15.1	\$19.14	1.0
1988	13.1	17.6	\$26.15	15.8	\$19.03	3.3
1989	13.8	18.4	\$19.56	13.1	\$16.75	2.1
1990	8.9	20.5	\$15.70	23.7	\$12.55	2.0

P = Preliminary **R** = Revised since last month

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity*.
1984-1990: Energy Information Administration, *Uranium Industry Annual*.

[2] Data for 1976-1981 includes both domestic utilities and agents.

[3] Includes imports by domestic utilities and domestic suppliers.

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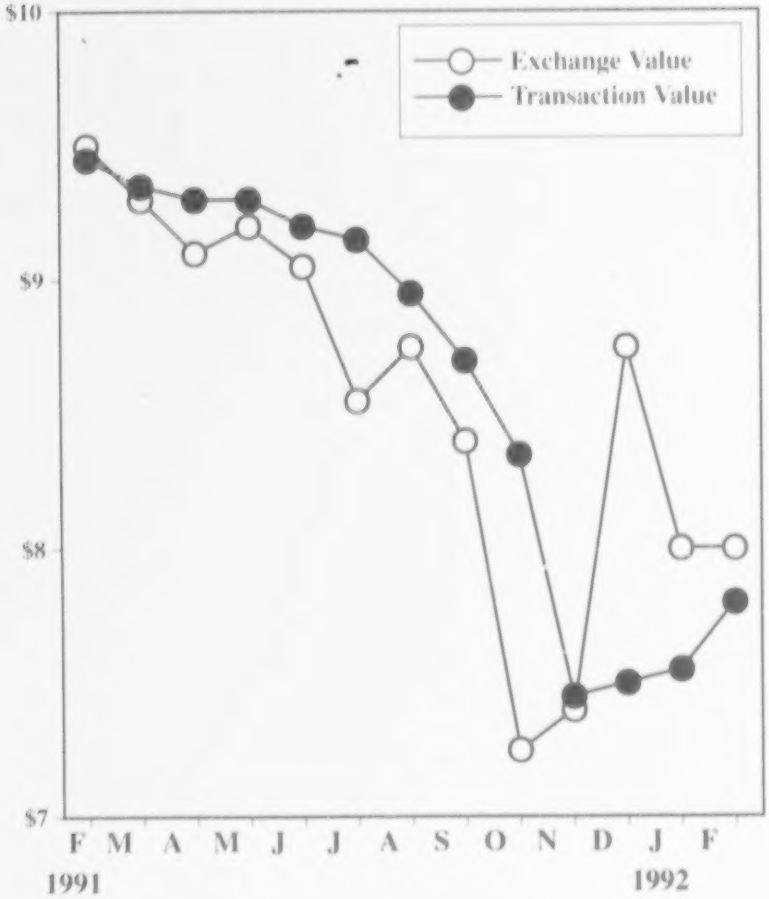

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- **Mexico**

On July 29, 1990, Mexico became the twenty-sixth country to generate electricity with a nuclear power plant, when its Laguna Verde 1 reactor reached commercial operation. The country's heavy reliance on oil and gas has led the government to continue to pursue its nuclear program, despite construction delays and financial challenges.

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- **Uranium Deposits in the Republic of Niger**

Operating the world's largest underground mine at Akouta, and a large open-pit operation at Arlit, Niger is one of the major uranium producers of the world. In addition, the country has numerous other undeveloped uranium deposits. Uranium is Niger's leading export commodity, accounting for about one-third of the country's export earnings.

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To Our Readers

NUEXCO will be hosting a hospitality suite at the US Council for Energy Awareness Fuel Cycle '92 Conference to be held March 22-25 in Charleston, South Carolina. We look forward to seeing you there.

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MARKET REVIEW

Market Values Summary

NUEXCO Market Values	This Report February 29, 1992	Last Report January 31, 1992	12 Months Ago February 28, 1991
EXCHANGE VALUE [1]	**\$8.00** / lb equivalent U_3O_8	\$8.00	\$9.50
UF_6 VALUE [2]	**\$24.25** / kg U as UF_6	\$24.50	\$27.75
LOAN RATE [3]	**3.0%** / annum	3.0%	3.5%
CONVERSION VALUE [4]	**\$1.60** / lb U as UF_6	\$1.60	\$1.45
SWU VALUE [5] (0.3 w/o tails assay)	**\$70** / SWU	\$71	\$50
TRANSACTION VALUE [6]	**\$7.80** / lb equivalent U_3O_8	\$7.55	\$9.45
Transactions	**23**	28	18
Months	**3**	3	3
Millions of Pounds	**6.6**	8.5	2.6

DEFINITIONS

[1] The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

[2] The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

[3] The **Loan Rate** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

[4] The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

[5] The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

[6] The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

a) Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;

b) At least ten transactions;

c) Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US\$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.
- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.
- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight-percent U^{235} and a product assay of 3.0 weight-percent U^{235}, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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FEBRUARY MARKET REVIEW

(as of February 29, 1992)

OVERVIEW

Neither buyers nor sellers were particularly aggressive during February, as they sought indicators of future market direction. As a result, the February 29, 1992, Exchange Value was unchanged at $8.00 per pound U_3O_8. Nevertheless, the market was fairly active with a total of nine uranium transactions reported. Average transaction size was small, as market participants were cautiously anticipating the next price move. Seven of the transactions involved concentrates, and all were priced at or near the current Exchange Value.

The UF_6 Value slipped $0.25, to $24.25 per kgU as UF_6, reflecting increased competition among sellers. One transaction was reported involving a small quantity of natural UF_6. No long-term uranium transactions were reported.

The Conversion Value was unchanged at $1.60 per pound U as UF_6. One intermediate-term sale was reported for a large quantity of conversion services. The Loan Rate remained unchanged at 3.0 percent per annum. No loans were reported.

Renewed competition among sellers led the SWU Value to decline one dollar, to $70 per SWU. One transaction was reported involving a small quantity of enriched uranium product (EUP).

February's nine sales of natural and enriched uranium totalled over 1.2 million pounds equivalent U_3O_8 (**Table 1**). This brings the year-to-date total to 18 sales and almost 2.8 million pounds equivalent U_3O_8, representing an average quantity per purchase of some 150 thousand pounds. The tendency thus far in 1992 is for buyers to purchase smaller quantities per transaction. By comparison, during 1991, the average transaction involved almost 270 thousand pounds. The lower average quantities purchased so far this year reflects the uncertainty of the current market and the consequent cautious reactions by both buyers and sellers.

Table 1

NEAR-TERM URANIUM SALES SUMMARY

	February 1992		Year-to-Date	
	No. of Sales	Volume[1]	No. of Sales	Volume[1]
Concentrates	7	1.0	15	2.6
Natural UF_6	1	0.1	1	0.1
EUP	1	0.1	2	0.1
Total[2]	**9**	**1.2**	**18**	**2.8**

[1] Million pounds equivalent U_3O_8

[2] Due to independent rounding, columns may not equal total.

NATURAL URANIUM AND CONVERSION

The February 29, 1992, **Exchange Value** remained at **$8.00** per pound U_3O_8, marking the first time since April 1990 that the Exchange Value was unchanged from the previous month. With the outcome of the anti-dumping petition against the former Soviet Union unknown, both buyers and sellers were reluctant to make substantial commitments and spent the month seeking indicators of future market direction. Adding to the uncertainty, some suppliers appeared to enter and exit the market randomly.

Much of February's demand came from discretionary buyers who purchased only moderate quantities. Sellers were also cautious. As a result, market volume was modest in February, and prices hovered near $8.00 per pound U_3O_8 during the entire month.

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Seven concentrates sales were reported in February, totalling slightly more than 1.0 million pounds equivalent U_3O_8. Six of the seven buyers were North American; the other was European. Utilities, producers, and intermediaries all made purchases, primarily from US and European intermediaries. All seven of the concentrates sales were concluded at price levels at or near the February 29 Exchange Value.

* * *

The **UF_6 Value** edged down \$0.25, to **\$24.25** per kgU as UF_6. Increased UF_6 supply led to heightened competition among sellers, which resulted in the price dip. UF_6 is now selling at a slight discount compared to the sum of the values of its components—concentrates and conversion. Only one natural UF_6 transaction was reported; a US utility purchased a small quantity of UF_6 for delivery in early 1993 from an intermediary.

* * *

No long-term uranium sales were reported in February. However, at month end, four utilities were evaluating long-term offers totalling 7.8 million pounds equivalent U_3O_8 for delivery during the period 1992-2000.

Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply[1]	Active Demand[1]
• Uranium (thousand lbs equivalent U_3O_8)	3,940	2,115
• Supply/Demand Ratio:	1.9	
• Loan (thousand lbs equivalent U_3O_8)	8,420	500
• Conversion (thousand lbs U as UF_6)	3,080	1,100
• SWU (thousand SWUs)	530	175

[1] Supply and Demand tables in the Market Review section of this Report provide details for each category.

* * *

The **Transaction Value** climbed \$0.25, to **\$7.80** per pound U_3O_8, based on 23 transactions over three months involving 6.6 million pounds equivalent U_3O_8. The removal of November's low-priced sales from the three-month, weighted moving average was the primary reason for the increase in the Transaction Value.

* * *

Comparatively stable price levels near eight dollars per pound attracted interest from both buyers and sellers in February. Although they were wary and did not rush to conclude sales, their entry into the market boosted **active uranium supply** by nearly 900 thousand pounds, to **3.9** million pounds equivalent U_3O_8, and also boosted **active uranium demand** by almost 600 thousand pounds, to **2.1** million pounds equivalent U_3O_8. The supply/demand ratio slipped slightly, to 1.9.

* * *

The **Loan Rate** remained unchanged at **3.0** percent per annum. Active loan supply jumped to 8.4 million pounds equivalent U_3O_8, and demand remained minimal in comparison (**Table 2**). No loans were reported in February.

* * *

The **Conversion Value** remained **\$1.60** per pound U as UF_6, although prices have tended to be slightly higher in Europe. One intermediate-term transaction was reported in which a utility purchased a large quantity of conversion services for delivery within the next two years.

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ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

After a year of steadily rising prices, the **SWU Value** reversed direction, at least temporarily, and declined one dollar, to **$70** per SWU. The decline reflected renewed competition among sellers in two areas. First, government-stockpiled material has re-emerged in the market, and the appearance of these supplies has raised new questions about the quantities of SWU available in the secondary market. Secondly, it became apparent that some primary enrichers are newly active in the spot market at competitive price levels.

Only one near-term enrichment transaction was reported. A US utility purchased EUP containing small amounts of equivalent feed and SWU. No long-term enrichment transactions were reported.

Table 3
ENRICHMENT PRICES
(February 29, 1992)

Prices	This Month Report 283	Last Month Report 282	12 Months Ago Report 271
NUEXCO SWU Value ($US per SWU)	70	71	50
US DOE SWU prices: ($US per SWU)			
USEC	121.50[1]	121.50[1]	117.85[2]
AFC	153.00[3]	153.00[3]	153.00[3]
Requirements	157.00[3]	157.00[3]	157.00[3]
Incentive Price (IP2)	104.67[4]	104.67[4]	100.68[5]
Calculated worth of enriched UF_6[6]: ($US per KgU as UF_6)			
2.0 w/o U^{235}	220	222	201
2.5 w/o U^{235}	309	311	277
3.0 w/o U^{235}	400	404	355
3.5 w/o U^{235}	494	498	435
4.0 w/o U^{235}	589	595	516
4.5 w/o U^{235}	686	692	598

[1] Effective 10/1/91.
[2] Effective 10/1/89 to 9/30/91.
[3] Effective since 10/1/84.
[4] Provisional IP2 for FY92: Effective 10/1/91 to 9/30/92, for up to 30% of annual requirements.
[5] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.
[6] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 w/o ^{235}U tails assay.

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RECENT TRANSACTIONS

Uranium Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5359	1992	50-100	98-102	Intermediary	Intermediary	
5360	1992	301-600	98-102	Utility	Intermediary	
5367	1992	101-300	98-102	Producer	Intermediary	
5368	1993	50-100	98-102	Utility	**R**	UF_6
5373	1992	50-100	98-102	Utility	Intermediary	
5374	1992	50-100	98-102	Producer	**R**	
5376A	1992	101-300	See Remarks	Utility	Intermediary	Contained in EUP
5378	1992	Less Than 50	**R**	Utility	**R**	
5380	1992	101-300	98-102	Producer	Intermediary	

Natural Uranium Loans[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Loan Rate	Borrower	Lender	Remarks
No Natural Uranium Loans are reported						

Conversion Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range[2] of Current Conversion Value	Buyer	Seller	Remarks
5357	1992-1993	601-1,000	103-110	Utility	**R**	

Enrichment Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity[3] (thousand SWU)	Price Within Percentage Range[2] of Current SWU Value[4]	Buyer	Seller	Remarks
5376B	1992	Less Than 50	See Remarks	Utility	Intermediary	Contained in EUP

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., **X** dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

Uranium Supply

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8)		Delivery Period	Remarks
	Spot or Near-term[1]	Intermediate or Long-term[2]		
AVAILABLE TO PURCHASE:				
ACTIVE				
91-1505	500	—	1992	
91-1506*	750	—	1992	U_3O_8/UF_6
91-1507	500	—	1992	
91-1511	260	—	1992	UF_6
91-1512	785	—	1992	UF_6
92-1501A*	645	—	1992	$UF_{6}e$
90-1231	500	500 per year	1992-1995	
91-1268	—	600 per year	1992-1999	
TOTAL	**3,940**			
INACTIVE	**4,930**			
AVAILABLE TO LOAN:				
ACTIVE				
91-1084*	3,900	—	—	U_3O_8
92-1008	495	—	—	UF_6
92-1017	900	—	—	U_3O_8
92-1060*	915	—	—	UF_6
92-1502*	210	—	—	UF_6
92-1503*	2,000	—	—	U_3O_8
TOTAL	**8,420**			
INACTIVE	**1,000**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: *none*

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NUEXCO

MARKET REVIEW

SUPPLY AND DEMAND

Uranium Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term [1]	Intermediate or Long-term [2]	Delivery Period	Remarks
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1247	500	—	1992	UF_6
92-1000	390	—	1993	UF_6
92-1043*	250	—	1992	U_3O_8/UF_6
92-1047*	5	—	1992	UF_6
92-1059A*	445	—	1992	UF_6e
92-1061*	400	—	1992	
92-1063*	125	—	1992	
91-1118	—	300 per year	1993-1998	U_3O_8/UF_6
91-1184	—	350 per year	1993-1997	
91-1290	—	310 per year	1995-1999	U_3O_8/UF_6
91-1294	—	250 per year	1996-2000	
92-1015	—	1,300 per year	1995-2004	
92-1032*	—	200 per year	1996-1998	U_3O_8/UF_6
91-1197	—	2,210	1992-1997	U_3O_8/UF_6
91-1227A	—	60	1992-1994	UF_6e
91-1232A	—	500	1993-1994	UF_6e
91-1283	—	5,225	1994-2000	U_3O_8/UF_6
92-1030	—	5,500	1992-1993	U_3O_8/UF_6
TOTAL	**2,115**			
INACTIVE	**2,125**			
INQUIRIES TO BORROW:				
ACTIVE				
92-1505*	500	—	—	U_3O_8
TOTAL	**500**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 91-1021, 91-1297, 92-1027, 92-1029A, 92-1034

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SUPPLY AND DEMAND

Conversion Supply and Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF6)		Delivery Period	Remarks
	Within 3 Years[1]	Beyond 3 Years[1]		
AVAILABLE FOR SALE:				
ACTIVE				
91-1500	440	—	1992	
91-1501	440	—	1992	
92-1506*	1,100	—	1992	
92-1507*	1,100	—	1992	
TOTAL	**3,080**			
INACTIVE	*None reported*			
INQUIRIES TO PURCHASE:				
ACTIVE				
92-1508*	1,100	—	1992	
91-1299	—	330	1993-1997	
TOTAL	**1,100**			
INACTIVE	**620**			

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 91-1275
Active Projects removed since last month: 91-1174

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SUPPLY AND DEMAND

SWU Supply And Demand

	Quantity (Thousand SWUs)			
NUEXCO Project Number	Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1509	200	—	1992	
91-1515	200	—	1992	
92-1501B*	130	—	1992	UF$_6$e
TOTAL	**530**			
INACTIVE	**685**			
INQUIRIES TO PURCHASE:				
ACTIVE				
92-1031	70	—	1992	UF$_6$e
92-1035*	5	—	1992	UF$_6$e
92-1059B*	100	—	1992	UF$_6$e
90-1196	—	60 per year	1995 on	
91-1142	—	75 per year	1995-2000	
92-1016	—	170 per year	1996-2006	
91-1152	—	2,700	1995-2001	
91-1171	—	560	1995-1998	
91-1227B	—	35	1992-1994	UF$_6$e
91-1232B	—	500	1993	UF$_6$e
91-1250	—	45	1993	UF$_6$e
92-1024*	—	12	1993	
TOTAL	**175**			
INACTIVE	**195**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 92-1029B
Active Projects removed since last month: 92-1058

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Exchange Value[1]

	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
Country (currency)	**This Month (Feb 29, 1992)**	**Last Month (Jan 31, 1992)**	**12 Months Ago (Feb 28, 1991)**	**This Month (Feb 29, 1992)**	**Last Month (Jan 31, 1992)**	**12 Months Ago (Feb 28, 1991)**
Australia (dollar)	10.61	10.66	12.10	27.59	27.71	31.46
Belgium (franc)	269.91	265.78	297.62	701.69	690.97	773.74
Canada (dollar)	9.46	9.40	10.94	24.60	24.43	28.44
EC (ecu)	6.41	6.31	7.06	16.66	16.41	18.36
Finland (markka)	36.03	35.16	34.84	93.66	91.41	90.58
France (franc)	44.60	43.96	49.18	115.95	114.29	127.86
Germany (mark)	13.11	12.90	14.46	34.09	33.55	37.60
Italy (lira)	9,840	9,696	10,802	25,582	25,207	28,082
Japan (yen)	1,035	1,006	1,254	2,692	2,616	3,261
Netherlands (guilder)	14.75	14.52	16.30	38.36	37.75	42.37
So. Africa (comm. rand)	22.75	22.42	24.39	59.15	58.27	63.41
So. Korea (won)	6,028	6,113	6,812	15,672	15,892	17,708
Spain (peseta)	826.28	811.61	900.13	2,148	2,110	2,340
Sweden (krona)	47.56	46.87	53.64	123.65	121.84	139.46
Switzerland (franc)	11.90	11.48	12.50	30.95	29.84	32.50
Taiwan (dollar)	198.40	200.00	253.65	515.79	519.96	659.44
UK (pound)	4.56	4.48	4.95	11.85	11.65	12.88
US (dollar)	8.00	8.00	9.50	20.80	20.80	24.70

Transaction Value[1]

	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
Country (currency)	**This Month (Feb 29, 1992)**	**Last Month (Jan 31, 1992)**	**12 Months Ago (Feb 28, 1991)**	**This Month (Feb 29, 1992)**	**Last Month (Jan 31, 1992)**	**12 Months Ago (Feb 28, 1991)**
Australia (dollar)	10.35	10.06	12.04	26.90	26.15	31.30
Belgium (franc)	263.16	250.83	296.05	684.15	652.10	769.67
Canada (dollar)	9.23	8.87	10.88	23.99	23.05	28.29
EC (ecu)	6.25	5.96	7.02	16.24	15.49	18.26
Finland (markka)	35.13	33.18	34.66	91.32	86.27	90.10
France (franc)	43.49	41.49	48.92	113.05	107.86	127.19
Germany (mark)	12.78	12.18	14.39	33.24	31.66	37.40
Italy (lira)	9,594	9,150	10,745	24,943	23,789	27,934
Japan (yen)	1,009	949.81	1,248	2,624	2,469	3,244
Netherlands (guilder)	14.39	13.70	16.21	37.40	35.62	42.15
So. Africa (comm. rand)	22.18	21.15	24.26	57.67	55.00	63.08
So. Korea (won)	5,877	5,769	6,776	15,280	14,998	17,615
Spain (peseta)	805.62	765.95	895.40	2,094	1,991	2,328
Sweden (krona)	46.37	44.23	53.36	120.56	114.99	138.72
Switzerland (franc)	11.61	10.83	12.44	30.18	28.17	32.33
Taiwan (dollar)	193.44	188.75	252.32	502.90	490.71	655.97
UK (pound)	4.44	4.23	4.93	11.55	10.99	12.81
US (dollar)	7.80	7.55	9.45	20.28	19.63	24.57

[1] As of May 1991 Report #273: calculated using currency exchange rates **for** the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273: calculated using currency exchange rates published in *The Wall Street Journal* **on** the last business day of the month.

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Conversion Value[1]

Country (currency)	per lb U as UF₆ This Month (Feb 29, 1992)	Last Month (Jan 31, 1992)	12 Months Ago (Feb 28, 1991)	per kg U as UF₆ This Month (Feb 29, 1992)	Last Month (Jan 31, 1992)	12 Months Ago (Feb 28, 1991)
Australia (dollar)	2.12	2.13	1.85	4.68	4.70	4.07
Belgium (franc)	53.98	53.16	45.43	119.01	117.19	100.15
Canada (dollar)	1.89	1.88	1.67	4.17	4.14	3.68
EC (ecu)	1.28	1.26	1.08	2.83	2.78	2.38
Finland (markka)	7.21	7.03	5.32	15.89	15.50	11.72
France (franc)	8.92	8.79	7.51	19.67	19.38	16.55
Germany (mark)	2.62	2.58	2.21	5.78	5.69	4.87
Italy (lira)	1,968	1,939	1,649	4,339	4,275	3,635
Japan (yen)	207.07	201.28	191.47	456.50	443.75	422.12
Netherlands (guilder)	2.95	2.90	2.49	6.51	6.40	5.48
So. Africa (comm. rand)	4.55	4.48	3.72	10.03	9.88	8.21
So. Korea (won)	1,206	1,223	1,040	2,658	2,695	2,292
Spain (peseta)	165.26	162.32	137.39	364.33	357.86	302.89
Sweden (krona)	9.51	9.37	8.19	20.97	20.66	18.05
Switzerland (franc)	2.38	2.30	1.91	5.25	5.06	4.21
Taiwan (dollar)	39.68	40.00	38.72	87.48	88.18	85.35
UK (pound)	0.91	0.90	0.76	2.01	1.98	1.67
US (dollar)	1.60	1.60	1.45	3.53	3.53	3.20

SWU Value And UF₆ Value[1]

Country (currency)	SWU Value at 0.30 w/o Tails Assay This Month (Feb 29, 1992)	Last Month (Jan 31, 1992)	12 Months Ago (Feb 28, 1991)	UF₆ Value per kg U as UF₆ This Month (Feb 29, 1992)	Last Month (Jan 31, 1992)	12 Months Ago (Feb 28, 1991
Australia (dollar)	92.88	94.60	63.69	32.17	32.64	35.35
Belgium (franc)	2,362	2,359	1,566	818.15	813.95	869.36
Canada (dollar)	82.81	83.39	57.58	28.69	28.78	31.96
EC (ecu)	56.07	56.02	37.16	19.42	19.33	20.62
Finland (markka)	315.24	312.05	183.37	109.21	107.68	101.77
France (franc)	390.25	390.15	258.85	135.20	134.63	143.66
Germany (mark)	114.74	114.52	76.12	39.75	39.52	42.24
Italy (lira)	86,101	86,050	56,850	29,828	29,693	31,552
Japan (yen)	9,059	8,932	6,602	3,138	3,082	3,664
Netherlands (guilder)	129.10	128.86	85.78	44.73	44.46	47.61
So. Africa (comm. rand)	199.09	198.94	128.37	68.97	68.65	71.25
So. Korea (won)	52,747	54,252	35,850	18,273	18,721	19,897
Spain (peseta)	7,230	7,203	4,738	2,505	2,486	2,629
Sweden (krona)	416.17	415.93	282.33	144.17	143.53	156.69
Switzerland (franc)	104.17	101.88	65.80	36.09	35.16	36.52
Taiwan (dollar)	1,736	1,775	1,335	601.39	612.50	740.93
UK (pound)	39.87	39.75	26.07	13.81	13.72	14.47
US (dollar)	70.00	71.00	50.00	24.25	24.50	27.75

[1] As of May 1991 Report #273; calculated using currency exchange rates **for** the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273; calculated using currency exchange rates published in *The Wall Street Journal* **on** the last business day of the month.

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WASHINGTON FOCUS

by Linda L. Gunter

In February, Congress began consideration of the President's FY1993 budget. DOE's budget request will be discussed throughout the month of March, as House committees with jurisdiction hold hearings. Energy Secretary James Watkins began the DOE budget review process with testimony on February 25 before the Energy & Power subcommittee of the House Energy & Commerce Committee. By the end of March, the House Appropriations Committee is expected to conclude its hearings on the Energy & Water Appropriations bill, which funds DOE's programs.

Senate Energy Bill Passed

◇ On February 19, the Senate completed its consideration of a comprehensive energy package, voting 94-4 in favor of the bill. Sponsored by Senators J. Bennett Johnston (D-LA) and Malcolm Wallop (R-WY), the bill was renumbered S 2166, after two controversial titles concerning opening the Arctic National Wildlife Refuge (ANWR) to oil drilling and Corporate Average Fuel Economy (CAFE) standards were removed. The remaining fourteen titles include provisions for nuclear plant licensing reform, uranium enrichment restructuring, and promotion of construction of standardized advanced reactor designs. Other titles concerning energy efficiency standards and reform of the Public Utilities Holding Company Act (PUHCA) are not included, but may be attached when the House begins consideration of the bill.

An amendment to the bill was approved allowing AVLIS to be licensed under *10 CFR Part 50* regulations, rather than *10 CFR Parts 40* and *70*. Those regulations apply to other fuel cycle facilities, including Louisiana Energy Services (see Monthly Report No. 267, November 1990). As a new technology, AVLIS can benefit from the extra time required by a two-step licensing process allowed under *Part 50*. Under this section, the Nuclear Regulatory Commission (NRC) may begin licensing with design information rather than a completed enrichment facility.

The House version of an omnibus energy bill, HR 776, has twelve titles, including provisions that restructure DOE's uranium enrichment program and outline licensing reform, but these titles are substantially different from the Senate's version. During a subcommittee hearing on DOE's FY 1993 budget request, Energy & Commerce Committee Chairman John Dingell (D-MI) stated that he intends to announce shortly his committee's mark-up schedule for HR 776. Reportedly this session could begin in March. Because of the substantial differences between the Senate and House versions of their energy bills, if the House passes its energy bill this year, it is likely a conference committee will be convened to try to arrive at a consensus energy package.

Proposed NRC Regulations on Fuel Cycle Facility Licenses

◇ The NRC has published NUREG 1324 entitled "Proposed Method for Regulating Major Materials Licensees". The report makes public the findings of a Materials Regulatory Review Task Force convened to propose an "ideal method for regulating these licensees, unfettered by any existing regulations or regulatory guidance." The task force was convened after the NRC investigated a potential criticality incident at General Electric's fabrication facility in Wilmington, NC, but focused on all fuel cycle facilities in light of problems at other plants.

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The task force concluded that current fuel cycle regulations do provide adequate safeguards, but that the safety regulations designed to protect workers and the public focus "almost exclusively on radiological safety concerns, practically to the exclusion of process safety and managerial controls." The task force concluded that the incidents occurring in the industry recently are more related to managerial lapses. Thus, the group proposed that NRC regulations be accompanied by a detailed standard format and content guide, and a standard review plan. The publications would define the topics and level of detail an applicant must cover in its application for a license.

The task force also considered more prescriptive requirements in *10 CFR Parts 30, 40,* and *70* and developed a general design criteria for major materials licensees. The report notes that the absence of guidance for the licensees makes it more difficult for the public to participate in the licensing process. The report also notes "As long as the focus of the regulations pertaining to large materials processors remains concentrated on radiological safety, NRC's attention to the adequacy of managerial controls (training of operators, process safety reviews, use of written procedures, proper sampling of materials to ensure meaningful measurements, change control over processes and procedures) will continue to languish. Lack of managerial controls contributed to both the Sequoyah Fuels event (1986) and the General Electric Plant incident (1991)".

The report adds that the NRC has more than 150 active regulatory guides pertinent to fuel cycle and materials licensing. More than 70 percent of these guides were issued at least ten years ago, and 50 percent were issued at least fifteen years ago. The task force believes these guides should be updated and revised regularly, perhaps every five years. The report recognizes that the volume of work required for the standards would represent a significant investment of staff time and technical assistance. However, the report did not note that since Congress had passed legislation authorizing collection of a user fee from nuclear utilities to fund 100 percent of the NRC's budget, the industry subject to this increased regulation would pay for any additional staff or expense caused by this new initiative. Because of the very nature of the NRC's responsibility to protect public health and safety, it is unlikely the industry can protest the new regulatory initiative without being accused by the public of trying to avoid higher safety standards. NRC staff has asked for public comment on NUREG 1324 by the end of April 1992.

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INDUSTRY BRIEFS

South Africa Announces Plans to Test Laser Enrichment

The Atomic Energy Corporation of South Africa, Ltd. recently announced that it plans to test a prototype molecular laser isotope separation (MLIS) enrichment unit by 1994. The tests will examine the economic and technical parameters of an MLIS plant, which uses lasers to excite molecules, rather than individual uranium atoms as used in the AVLIS process under development in the USA and France. South Africa also had been pursuing research efforts on centrifuge enrichment, but has ceased that work and decided to focus on MLIS development.

◆ ◆ ◆

Czech Utility and French Firm to Establish Joint-Venture

Ceske Energeticke Zavody (CEZ), a Czech utility, and SGN, a French engineering firm owned primarily by Cogema, have agreed to set up a joint-venture by the end of 1992 to provide engineering and project management services. The venture will focus on a much-needed program of investment in energy generation and distribution facilities in the Czech and Slovak Federal Republic, but also will offer numerous other technical services.

US Uranium Industry Not Viable for Seventh Consecutive Year

In January, Secretary of Energy James Watkins determined that the US domestic uranium industry was not viable in 1990. The determination was based on data supplied by DOE's Energy Information Administration and criteria established by Congress. This marks the seventh consecutive year (since 1984) that the industry has been declared non-viable.

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Yankee Rowe to Close

On February 26, Yankee Atomic Electric Company's Board of Directors voted to close permanently its 167-MWe PWR at Rowe, Massachusetts. The oldest operating reactor in the USA (it began operation in 1961) was closed due to economics and safety concerns about reactor vessel embrittlement.

The reactor initially was shut down voluntarily October 1, in response to an NRC staff recommendation requesting detailed analysis on the reactor's response under certain accident scenarios. After several months of evaluation, Yankee estimated that it could spend at least $23 million more on analysis. Moreover, even that might not ensure restart of the plant or address all the issues, since the regulatory criteria for restart has still not been agreed to by the NRC and Yankee. Given this situation, and the plant's higher operating costs, the Board decided to close the plant. Decommissioning plans and related activities have already begun.

Taiwan Progresses Toward Approval of Two More Nuclear Plants

In February, the Taiwan government approved plans to proceed with construction of the country's seventh and eighth nuclear units. Early in the month, the Ministry of Economic Affairs recommended that planning work on the units resume, and shortly thereafter the Executive Yuan (Cabinet) provided its endorsement as well. The last major hurdle for the project will be getting approval from the Legislative Yuan to reactivate previously frozen funds of US$316 million for preparatory work on the units. Plans for the two 1,000 MW units have been deferred for over five years.

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Trojan to Restart with New Tube Plugging Criterion

The US Nuclear Regulatory Commission (NRC) has approved new steam generator tube plugging criterion for Portland General Electric Company's Trojan nuclear plant. As a result, the 1,095-MWe PWR will be allowed to restart. The new criterion will determine the seriousness of a crack not by crack depth, but by voltage measurements from eddy current tests. This allows the utility to disregard microscopic, deep cracks that do not affect the integrity of the tube. The NRC also may publish a generic communication regarding the topic.

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MEXICO

On July 29, 1990, Mexico became the twenty-sixth country to generate electricity with a nuclear power plant, when its Laguna Verde 1 reactor reached commercial operation. Officially named the United Mexican States, the country is a federal democratic republic with 31 states and one federal district. The country has vast natural resources, with large reserves of natural gas and oil. Mexico is the world's fourth largest producer of oil and the primary supplier of oil to the United States. The country has a rapidly growing population, currently exceeding 80 million, and as a result, has growing energy demands. Mexico relies on oil for more than 50 percent of its electrical energy needs, and hydroelectric for over 25 percent. This heavy reliance on oil has led the government to seek to diversify its supply sources and to reduce its CO_2 emissions. As a result, Mexico has continued to pursue its nuclear program, despite construction delays and financial challenges.

ELECTRICITY SUPPLY

Mexico's population is not only growing quickly, but shifting to urban areas as well. This growth, combined with the change in concentration of the population, has led to very rapid growth in energy demand. In the 1980s, electricity demand grew at an average annual rate exceeding six percent, but varied from two to eight percent per year. Electricity demand is currently forecast to grow at over seven percent per year during the 1990s.

Mexico's national utility, Comisión Federal de Electricidad (CFE), has pursued a number of options to meet the rising demand. Its primary fuel source for electricity generation is, and will remain, oil. Although the country's national energy plan (Programa Nacional de Modernizacion Energetica) calls for reduced CO_2 emissions and for CFE to develop other energy sources, well over half of the country's electricity throughout most of the 1990s still will be fueled by oil. This actually represents significant progress, as Mexico relied on oil for 90 percent of its energy as recently as 1985. The current energy plan forecasts almost 34,000 MWe of installed electrical-generating capacity by the mid-1990s.

The other major facet of Mexico's energy plan is to increase efficiency in electricity consumption. The enormous foreign debt the country incurred during its expansion in the 1970s remains an onerous burden and has limited development. Thus, conservation and improved efficiency are key elements in satisfying demand and conserving the country's limited capital resources. The government's moves toward economic liberalization in recent years have stimulated Mexico's economy and resulted in a renewed positive environment for foreign investment.

Following oil, hydroelectric power is the next most important source of electricity in Mexico, generating over one quarter of the country's total output. While there still are untapped resources, much of this potential hydroelectric capacity is not economic, given its large distance from population centers.

Mexico has large coal reserves, but most are of lower quality and, given the emphasis on lowering CO_2 emissions, not well-suited for power station utilization. Nevertheless, in seeking to diversify its supply sources and reduce its reliance on oil, Mexico has built several coal-fired stations (its first large station, 1,200 MWe, started operation in 1982) and has plans for further expansion. Mexico imports coal for these stations, which currently represent about 4.5 percent of total installed generating capacity. These stations, along with conservation and improved efficiency, will have the largest impact on meeting Mexico's growing energy needs in the 1990s.

Geothermal energy also is being used to meet the increased energy demand, and already accounts for 2.7 percent of total capacity at present. In addition, Mexico will rely on independent power producers in the near-term to supply about eight percent of the country's total electricity generation.

In the longer term, Mexico plans to enlarge the role of geothermal power and nuclear power. Several hundred geothermal sites already have been identified, but development is costly and many years away. Once Laguna Verde 2, Mexico's second nuclear plant, begins operation in 1994, nuclear power will represent approximately five percent of the country's total generating capacity.

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NORTH AMERICAN FREE-TRADE AGREEMENT

In 1988, Carlos Salinas de Gortari was elected Mexico's president, and he began aggressively implementing market reforms to focus his country on the growing international economy. In addition to privatizing several once-nationalized companies, Salinas boldly pushed for a free-trade agreement with the USA. In the spring of 1991, the US Congress granted "fast-track" status to the free-trade negotiations, allowing the US trade representative to negotiate a treaty directly with Mexico and then have the US Congress vote on the entire treaty as a complete package. In February 1991, Canada signed as a full party to the negotiations, which will be known as the North American Free Trade Agreement. President Salinas of Mexico has been active in the negotiations, and has worked to ensure that the principle concerns of environmental protection, health and safety of workers, and a fear of the loss of US manufacturing jobs will be successfully solved.

Early concerns over Mexico's prohibition of foreign-owned mineral resources projects were alleviated when Mexico revised its mining laws to permit foreign investors to own 100 percent of an operating mining project for up to 12 years. (However, uranium deposits have been excluded from this change, as the mineral is considered strategic.) Nevertheless, the possibility of a North American free-trade zone including Canada, the USA, and Mexico has created optimism for renewed economic growth that will enable Mexico to handle its current financial difficulties and go forward with major development projects, such as new power plants.

NUCLEAR POWER

Mexico established its National Commission for Nuclear Energy (CNEN) in 1956, as its first step toward adopting nuclear power. During the 1960s, CFE solicited offers for nuclear stations and examined several potential sites. By 1972, the country had selected General Electric to supply one 640-MWe boiling water reactor at Laguna Verde, approximately 70 kilometers north of the city of Veracruz, on the Gulf of Mexico (**Figure 1**). One year later, CFE exercised an option to purchase a second unit. Construction on the station did not begin until 1976, and organizational, political, and economic problems led to extensive construction delays. Unit 1 finally began commercial operation in July 1990.

Organization

CFE reports to the Ministry of Energy and Mines (Secretaría de Energía, Minas e Industria Paraestatal-SEMIP), which also controlled the Institute for Nuclear Energy, the successor to the CNEN. In 1979, the Institute was divided by law into three major organizations. Uranio Mexicano (Uramex) was responsible for managing the country's fuel cycle. It was established to develop a uranium industry for Mexico, but due to the slow progress of the country's nuclear program and a weak uranium market, Uramex was dissolved in 1985. The National Nuclear Research Institute is the organization that handles all nuclear research and development. The third organization is the National Nuclear Safety and Safeguards Commission (CNSNS), which is responsible for nuclear regulatory functions. It also is responsible for Mexico's safeguards and non-proliferation efforts. Mexico has assumed an active role in this area and was instrumental in the establishment of the Treaty for the Prohibition of Nuclear Weapons in Latin America (Tlatelolco Treaty).

CFE is responsible for the design, construction, and operation of all Mexico's power-generating stations, including its nuclear power plants. The utility has managed construction and has also been involved in the design of both Laguna Verde units. It also handles fuel procurement for the station in all phases of the nuclear fuel cycle.

Laguna Verde Station

CFE has been involved with the Laguna Verde project since its inception. Financing for construction of the station was provided by internationally sourced loans warranteed by the Export/Import Bank. Construction of Unit 1 began in 1976 and was completed in 1987. Like many projects in the USA and elsewhere, construction was delayed by a combination of political, regulatory, and economic/financial factors, and even by a change of the architect-engineering firm (Ebasco replaced Burns & Roe in 1976, about the time construction began). The unit received a favorable review by an International Atomic Energy Agency OSART inspection (Operational Safety and Review Team) in late 1987, but political considerations delayed fuel loading until October 1988. The unit was connected to the grid in April 1989, and reached full power on March 17, 1990. It was declared in commercial operation on July 29, 1990.

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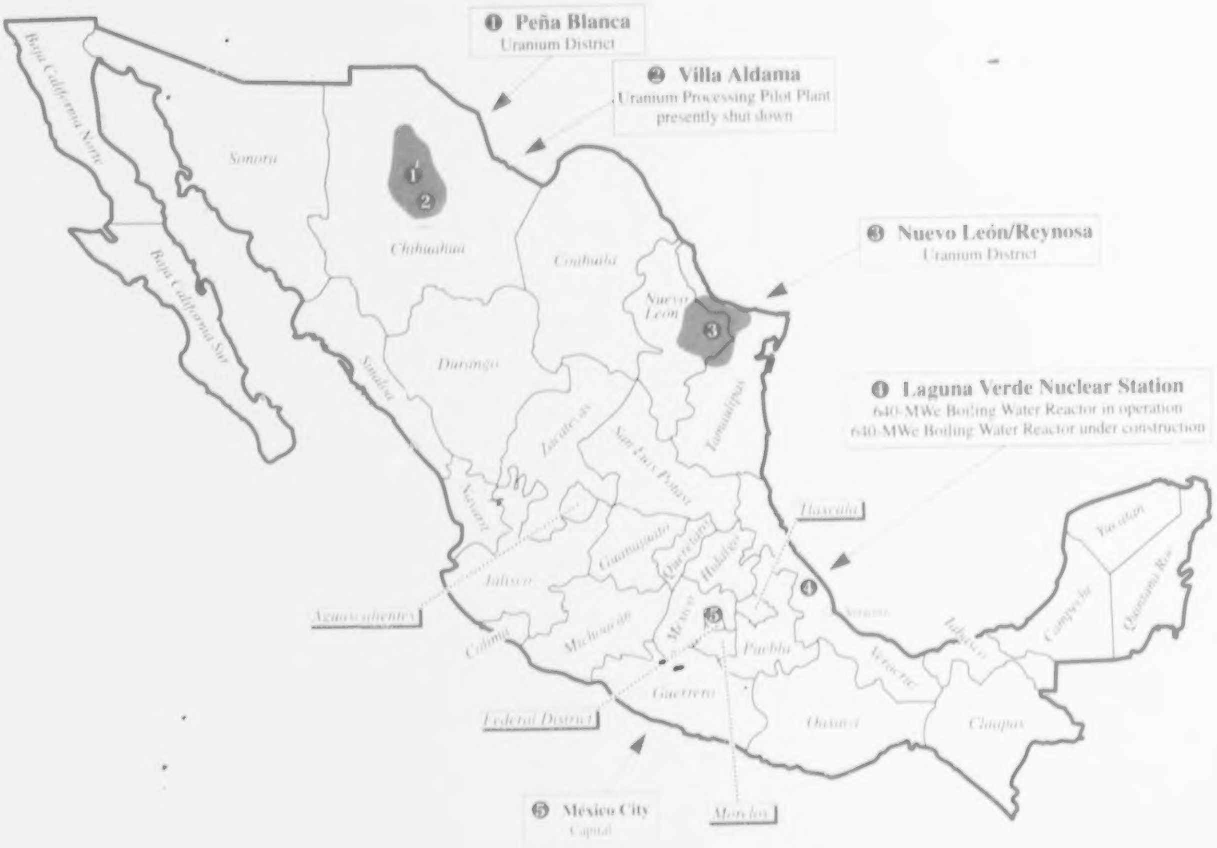
Figure 1
MEXICO's NUCLEAR STATION and IMPORTANT URANIUM DISTRICTS



❶ Peña Blanca
Uranium District

❷ Villa Aldama
Uranium Processing Pilot Plant
presently shut down

❸ Nuevo León/Reynosa
Uranium District

❹ Laguna Verde Nuclear Station
640-MWe Boiling Water Reactor in operation
640-MWe Boiling Water Reactor under construction

❺ México City
Capital

Baja California Norte
Baja California Sur
Sonora
Chihuahua
Coahuila
Nuevo León
Durango
Sinaloa
Zacatecas
San Luis Potosí
Tamaulipas
Nayarit
Jalisco
Guanajuato
Querétaro
Hidalgo
Tlaxcala
Aguascalientes
Colima
Michoacán
México
Puebla
Veracruz
Tabasco
Campeche
Yucatán
Quintana Roo
Guerrero
Oaxaca
Chiapas
Federal District
Morelos
1
2
3
4
5

From early on, CFE took advantage of international expertise to improve the future performance of its first nuclear plant. Unit 1 received OSART visits in 1980, and twice in 1987. CFE accepted information from the Institute of Nuclear Power Operators (INPO) about the start-up of Unit 1 and about emergency planning for the station. CFE is also a founding member of the World Association of Nuclear Operators (WANO), which provided input on how to operate the plant effectively. In addition, plant management developed a working relationship with the Cofrentes plant (939-MWe BWR) in Spain, gaining valuable insight on operating a similar unit.

After numerous delays in construction and fuel loading, Unit 1 finally sustained criticality on February 5, 1989, but CFE experienced additional delays during the start-up of the reactor. In April 1989, CFE shut down the reactor for four days to improve the coolant water quality, even though technical specifications had not been exceeded. CFE's efforts focused on reactor coolant water cleanliness and conductivity, which had been affected by oxidation in the system. Start-up of the turbine and synchronization to the grid went well; it was expected to take 10-12 days, yet was accomplished in only three. So while start-up of Unit 1 took much longer than planned, serious problems were limited, and its performance in terms of number of scrams was comparable to an average plant start-up in the USA.

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Table 1
NUCLEAR POWER UNITS IN MEXICO

Units In Operation

Unit	Lead Utility or Fuel Buyer	Capacity (MWe net)	Type	COD[1]	1991 Capacity Factor (percent)	Total 1991 Electricity Generation (GWh net)
Laguna Verde 1	CFE[2]	640	BWR	1990	72	4,022

Units Under Construction

Unit	Lead Utility or Fuel Buyer	Capacity (MWe net)	Type	Projected COD	Percent Complete
Laguna Verde 2	CFE	640	BWR	1994	72

[1] COD= Commercial Operation Date
[2] CFE =Comisión Federal de Electricidad

The additional time made available by the delayed start-up allowed more time for training, which apparently paid off: Unit 1 set a new record by staying on-line for 250 consecutive days from its first commercial operation date. In its record run, which broke the record held by Philadelphia Electric's Limerick 1 plant, Laguna Verde 1 generated over 5,700 GWh before shutting down for its first scheduled refueling. It achieved a capacity factor of over 88 percent during the first cycle. The refueling went smoothly, taking 72 days. The unit was back at full power by November 12, 1991, and by year end, had generated 4,022 GWh during 1991 and achieved a capacity factor of 72 percent for the year (**Table 1**).

Laguna Verde 2, a twin of Unit 1, is 72 percent complete and commercial operation is now planned for 1994. Unit 2 faces the same challenges that faced Unit 1; however, CFE remains committed to the plant's completion and has increased its rate of progress on the unit in recent years. CFE also now uses a simulator built at the Laguna Verde site to train operators.

Opposition to nuclear power in Mexico was quite active during construction of the plant, but the unit's operational success has quieted most opponents, since most of the opposition was motivated by politics or environmental concerns. CFE operates an information center at the Laguna Verde station and promotes visits by the public to enhance good relations with the local population.

Future Plans

During the 1970s, Mexico's national energy plans envisioned 20,000 MWe of installed nuclear capacity by the year 2000. But the collapse of oil prices in the 1980s and the country's resulting economic crisis caused the cancellation of virtually all of these plans. The most recent national energy plan (1990-1994) calls for the completion of the Laguna Verde station. Studies on the feasibility of constructing additional reactors have projected that perhaps as much as 6,900 MWe of new nuclear capacity could be on-line by 2010. While this may seem optimistic, the excellent performance thus far of Laguna Verde 1, and Mexico's need to use its oil to power over 65 percent of CFE's generating capacity as well as create foreign exchange through oil exports, mandates an increased nuclear commitment.

FUEL CYCLE CONTRACTING

CFE has responsibility for all fuel procurement for the Laguna Verde station. While officially the Ministry controls this area, it has delegated the responsibility to CFE. To date, the utility has purchased its uranium under Mexican uranium procurement laws, and it has indicated it may fill some of its future needs from domestic sources, if and when Mexico's uranium industry goes into production. Mexico is currently negotiating IAEA safeguards agreements with Canada and Australia, but has not yet finalized the agreements, thereby limiting CFE's uranium supply options.

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The Laguna Verde station (**Figure 2** and **Figure 3**) is operating on one-year cycles, and CFE has already acquired fuel for the first four cycles of Unit 1, as well as the initial core for Unit 2. Annual refueling outages will occur in early autumn, right after the rainy season in Mexico. This allows CFE to rely upon its hydroelectric capacity when the reservoirs are at their fullest to counterbalance the lack of nuclear capacity.

CFE's enrichment services are supplied by the US Department of Energy, to which the utility is fully committed through 1996. General Electric, the Laguna Verde reactor supplier, also supplies CFE's fuel fabrication services. The National Nuclear Research Institute is expecting to complete a pilot plant at Salazar this year that will be able to fabricate fuel elements using imported components. The plant will have the capability to produce up to twenty fuel assemblies at one time. The first four prototype fuel bundles are expected to be used in the third reload at Unit 1, scheduled for October 1993. An additional four prototype fuel bundles are expected to be included in the fourth reload.

Spent Fuel Storage

Mexico has no permanent high-level waste repository as yet, and will store its spent fuel on site. In late 1990, CFE awarded a contract to Holtec International to install super high-density spent fuel racks in pools at Units 1 and 2. The process boosted each pool's capacity to more than 3,300 assemblies, enabling the pools to hold the discharged fuel bundles for the entire expected lifetime of each reactor.

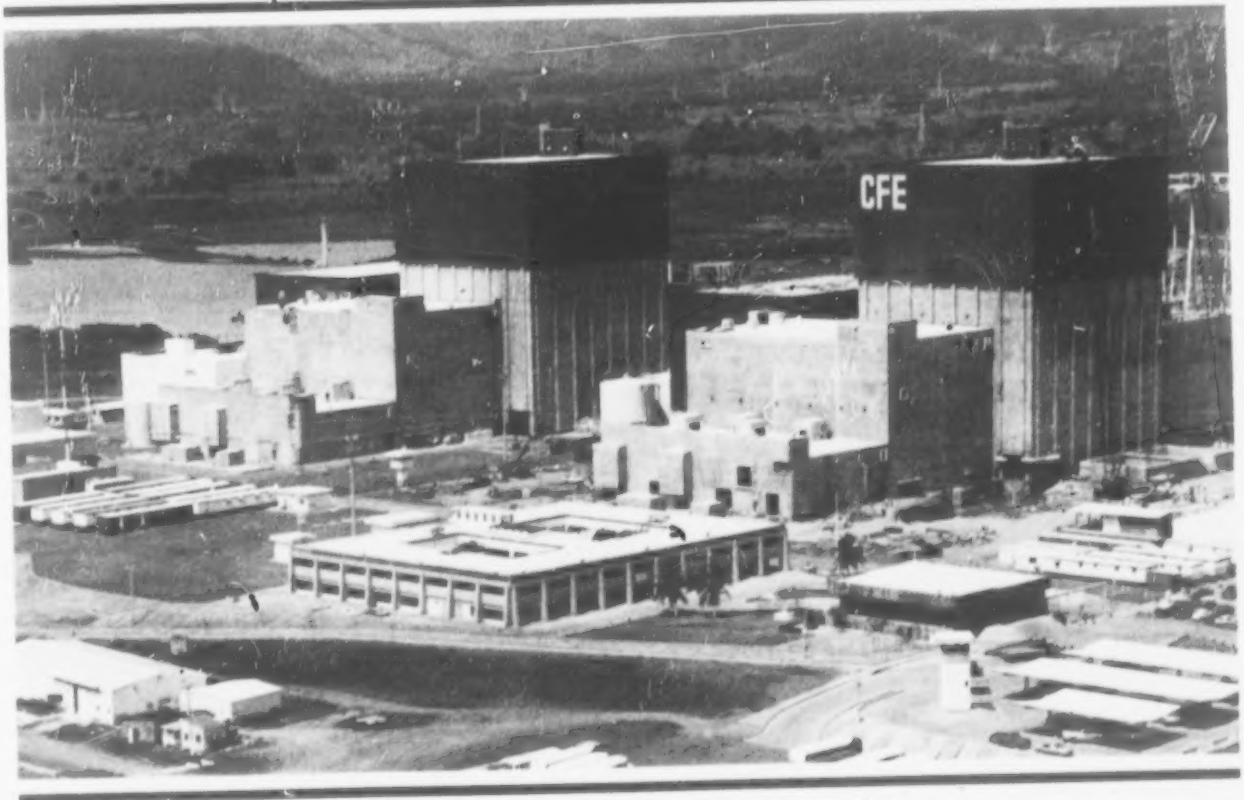

Figure 2 — Laguna Verde Nuclear Power Station

The station consists of two 640-megawatt boiling water reactors. Unit 1 began commercial operation on July 29, 1990, and operated continuously for 250 days, setting a new record for continuous first-cycle operation of a BWR. Unit 2 is under construction and more than 70 percent complete, and is planned to begin commercial operation in 1994.

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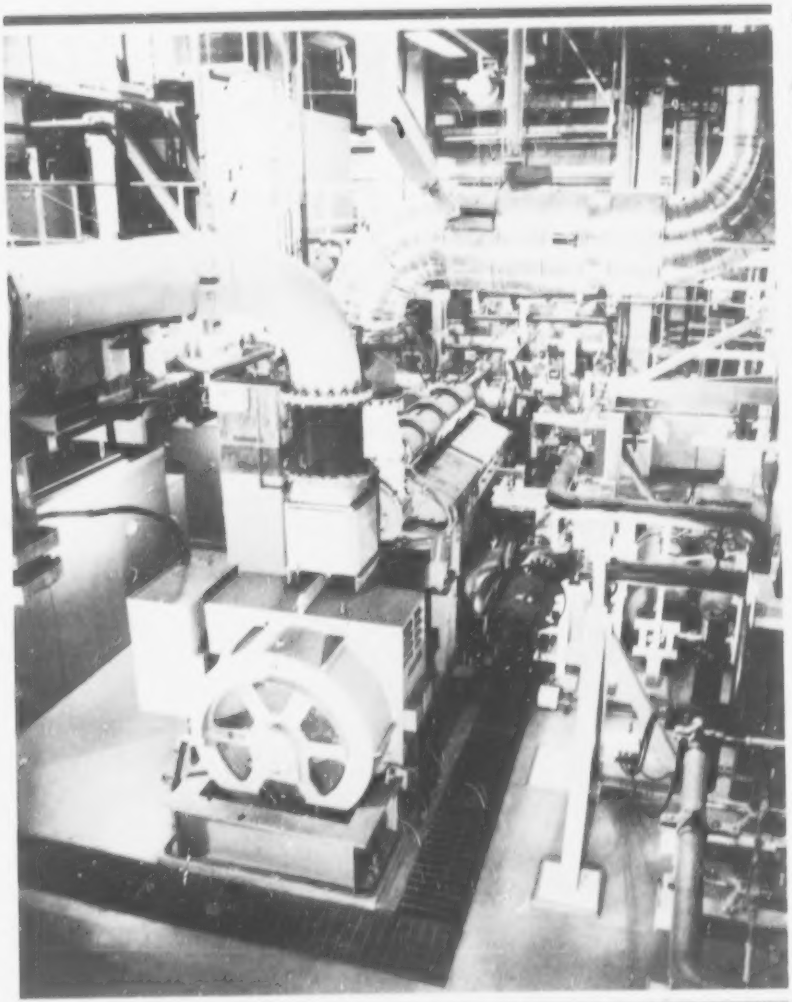

Figure 3 — Interior of Unit 1 at the Laguna Verde Nuclear Station

URANIUM RESOURCES

Uranium exploration began in Mexico in the late 1950s, with a renewed effort beginning again in 1979. But with the slowdown of the country's nuclear program, exploration had essentially ceased by 1983. Nevertheless, Mexico has identified approximately twenty million pounds equivalent U_3O_8 of reasonably assured resources, plus eight million pounds of estimated additional resources. The primary deposits are located in the states of Chihuahua and Nuevo León in northern Mexico, although no deposits have been commercially developed. Additional reserves have been located in Sonora, Oaxaca, Durango, Sinaloa, and Tamaulipas.

Geology

Most of the exploration activity in Chihuahua has been concentrated along the east flank of the Peña Blanca Mountains. The principal uranium district is situated 40 to 60 miles northeast of the city of Chihuahua where important mineralization occurs in volcanic rocks of Tertiary Age. The mountainous area is characterized by regional north-south faulting and localized ring faulting in caldera-related structures. Geologically, the highland area is referred to as the Aldama Platform. The same volcanic sequence was deposited upon Cretaceous limestones to the east in a structural basin referred to as the Chihuahua Trough.

The mesozoic sediments filling the Trough were subjected to intense folding, faulting, and erosion. Limestone conglomerates were formed throughout much of the region. Deposition of volcanic ash and flow material followed. Subsequent to a period of rapid erosion, minor faulting and alteration affected the volcanic material, creating favorable host conditions for uranium mineralization within volcanic remnants scattered throughout the Trough area.

Mineralization

Mineralization in the limestone has collected in faults, fractures, bedding planes, and solution cavities directly beneath the overlying Nopal Formation. Uranium mineralization in the volcanics is limited to ash-flow tuffs, and welded or reworked tuffs. It is primarily concentrated in fractures, faults and associated brecciation, and zones of high permeability and alteration, as in lenses of pumice. Uraninite is the principal ore mineral present. Uranophane occurs as an important secondary mineral in altered rock, usually associated with highly porous or brecciated zones. Ore grades range between 0.1 and 0.5 % U_3O_8.

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Production

A pilot processing plant, the Villa Aldama mill, at Peña Blanca in Chihuahua operated for a brief period in the 1960s. In the late 1970s, Uramex started construction on its first commercial-scale uranium processing plant at Peña Blanca with a designed milling capacity of 650 tons of ore per day. However, the plant was never completed, as Uramex was dissolved when the government decided to shift its emphasis away from the uranium industry. The limited production from the pilot plant, as well as uranium produced as a by-product of other operations, totalled only about 100 thousand pounds equivalent U_3O_8. Deposits in the state of Nuevo León, only a few hundred miles south of Duval County, Texas, show particular promise for exploitation using in-situ leaching techniques. In addition, estimates have indicated that perhaps as little as fifteen percent of Mexico has been explored. The known deposits, combined with undiscovered resources, probably give the country the capability to develop a uranium production industry to supply an expanding domestic nuclear power program. At this time, however, Mexico is not planning any development, primarily due to low market prices for uranium.

OUTLOOK

Despite some major economic, political, and technical challenges, Mexico has achieved a place in the world nuclear community. The Laguna Verde project is a success; Unit 1 is operating well, and construction of Unit 2 continues toward a 1994 start. The potential North American Free-Trade Zone would be a great boost economically and further stimulate growth. With this growth will come an increased demand for energy, but with continued good performance at Laguna Verde and the security of a potential domestic uranium industry, CFE can continue to diversify its energy supply sources and to provide the electricity so vital for the development of an industrializing country.

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NUEXCO

URANIUM DEPOSITS IN THE REPUBLIC OF NIGER

Niger is located at the southern edge of the Sahara desert in north-central Africa. The country covers a territory of 1,267,000 square kilometers (489,191 square miles), or about three times the size of California, with a population exceeding 7.5 million people. In 1989, Niger abandoned 16 years of military rule and is now on the way to a democratic system; the first multiparty elections are scheduled for 1992. Mining industries are the primary base for Niger's economy. Uranium is the leading export commodity, with revenues accounting for about one-third of Niger's export earnings. Other mineral products include coal, tin, and small amounts of gold.

URANIUM INDUSTRY

Niger's uranium mines are located in the Agadez region of the country, approximately 850 km northeast of the capital Niamey (**Figure 1**). The mining district is about 2,000 km from both the Gulf of Benin/Atlantic Ocean and the Mediterranean Sea.

Uranium was first discovered in the Azelik region in 1957. These discoveries led to a major exploration campaign by the French conglomerate, Commissariat à l' Energie (CEA), in the Tim Mersoï sedimentary basin. The efforts resulted in the discovery of sandstone-type uranium deposits at Arlit in 1965, Akouta in 1972, and through 1979, additional discoveries at Imouraren, Afasto-Ouest (West), Tassa N' Taghalgue/Arni, Azelik, and Abakoroun, as well as a number of other deposits (**Table 1**). Expenditures for exploration through 1990 totalled almost US$190 million, with almost 90 percent of the total invested prior to 1983.

The Arlit, Arni, Akouta, and Afasto-Ouest deposits are located near one another in a 20 km-long zone. Imouraren is located approximately 80 km further south; Azelik, 160 km southwest; and Madaouela, 40 km southeast. Niger's total uranium resources recoverable at less than $30 per pound U_3O_8 have been determined as:

REASONABLY ASSURED RESOURCES (RAR)=
452 million pounds U_3O_8 (174 thousand MTU)

ESTIMATED ADDITIONAL RESOURCES (EAR)=
738 million pounds U_3O_8 (284 thousand MTU)

In the 1970s, two production centers at Arlit and Akouta were developed, along with the complete infrastructure necessary in this isolated, semi-desert region. Two mining towns also were constructed, Arlit and Akokan, totalling about 50 thousand inhabitants. A 2,000 km-long, all-weather road was specially built to connect the mining district with Agadez and Niamey in Niger, and Cotonou in Benin. Uranium concentrates are hauled by truck on this road 1,600 km to Parakou in Benin, and then 430 km by rail to Cotonou, the principal port for material shipment.

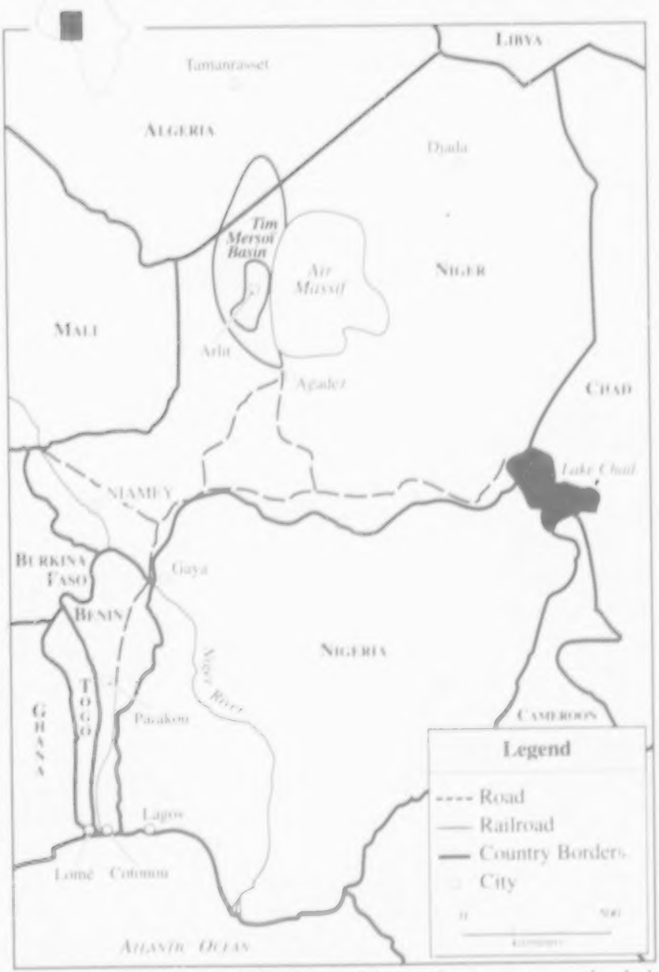

Figure 1 — Uranium Districts in Niger. Concentrates are hauled by truck to Parakou, and then by rail to Cotonou for shipping.

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Table 1
IMPORTANT URANIUM DEPOSITS OF NIGER

Deposit/Project	Avg. ore grade (% U_3O_8)	Estimated reserves (mill. lbs. U_3O_8)	Production Status
Akouta Project	0.5	154	in production
Arlit Project	0.3	110	in production
Imouraren	0.18	274	undeveloped
Tassa N' Taghalgue/Arni	0.29	148	undeveloped
Afasto-Ouest	0.29	83	undeveloped
Azelik/Abakoroun	0.25	36	undeveloped
Madaouela	n/a	17	undeveloped
Sekiret	0.13	10	undeveloped

Niger's total uranium production through 1991 totalled over 130 million pounds equivalent U_3O_8. The annual production rate is presently over seven million pounds U_3O_8. More than half of Niger's uranium output goes to France, primarily through purchases by Cogema. The balance of the output goes to Japanese and Spanish interests. The sales price of uranium from Arlit was 22,000 CFA francs per kgU in 1990 (approximately US$33 per pound U_3O_8 at an exchange rate of 300 CFA francs = US$1), although Cogema reportedly paid 19,000 CFA per kgU.

ARLIT AND AKOUTA OWNERSHIP

Akouta is the world's largest underground uranium mine and is owned by the consortium, Cominak (Compagnie Minière d'Akouta), which is composed of Cogema, Onarem, OURD, and ENUSA (**Table 2**). The Arlit project is a series of open-pit mines, owned by Société des Mines de l' Air (Somair), and operated by Cogema. Ownership interests in Somair are given in **Table 3**.

The government of Niger owns shares in all of the country's uranium projects through the state company Onarem (Office National des Ressources Minière). Most of Niger's undeveloped uranium deposits are owned, in conjunction with Onarem, by Cogema or other interests from Japan, Germany, Kuwait, and the UK.

Following Niger's independence from France in 1960, the government agency Uraniger was formed to administer land concessions for uranium exploration and development. Uraniger signed the original concession contracts with the French companies that form the basis of Niger's current uranium industry. Akouta and Arlit are located on one of these concessions. In an effort to become more involved in the country's uranium operations, the government established Onarem in 1976, replacing Uraniger as the coordinator and participant in all uranium exploration and development in Niger. Onarem is required by law to be a partner in all uranium ventures in the country. The company operates under the auspices of the Ministry of Mines, and also is responsible for marketing Niger's share of output.

REGIONAL CHARACTERISTICS

Geology

Niger's uranium deposits occur in sediments of the Tim Mersoi Basin that constitutes the northeast portion of the vast intracratonic Iulledem Basin. Precambrian crystalline rocks form the basement and include a variety of granitic and metamorphic facies. The facies are cut by ring structure granites, extensive acid volcanic complexes of Paleozoic age (rhyolite, tuff, ignimbrite, and Cenozoic and Quaternary trachy-phonolitic and basaltic extrusions). Alternating continental, epicontinental, and shallow marine sediments of

Table 2
COMINAK OWNERSHIP

Cogema (France)	34%
Onarem (Niger)	31%
Overseas Uranium Resources Development Company (Japan)	25%
ENUSA (Spain)	10%

Table 3
SOMAIR OWNERSHIP

Onarem (Niger)	33.0%
Cogema (France)	27.0%
Compagnie Française de Mokta[1] (France)	19.4%
Uranium Pechiney (France)	7.6%
Urangesellschaft mbH (Germany)	6.5%
Agip SpA (Italy)	6.5%

[1] Subsidiary of Cogema

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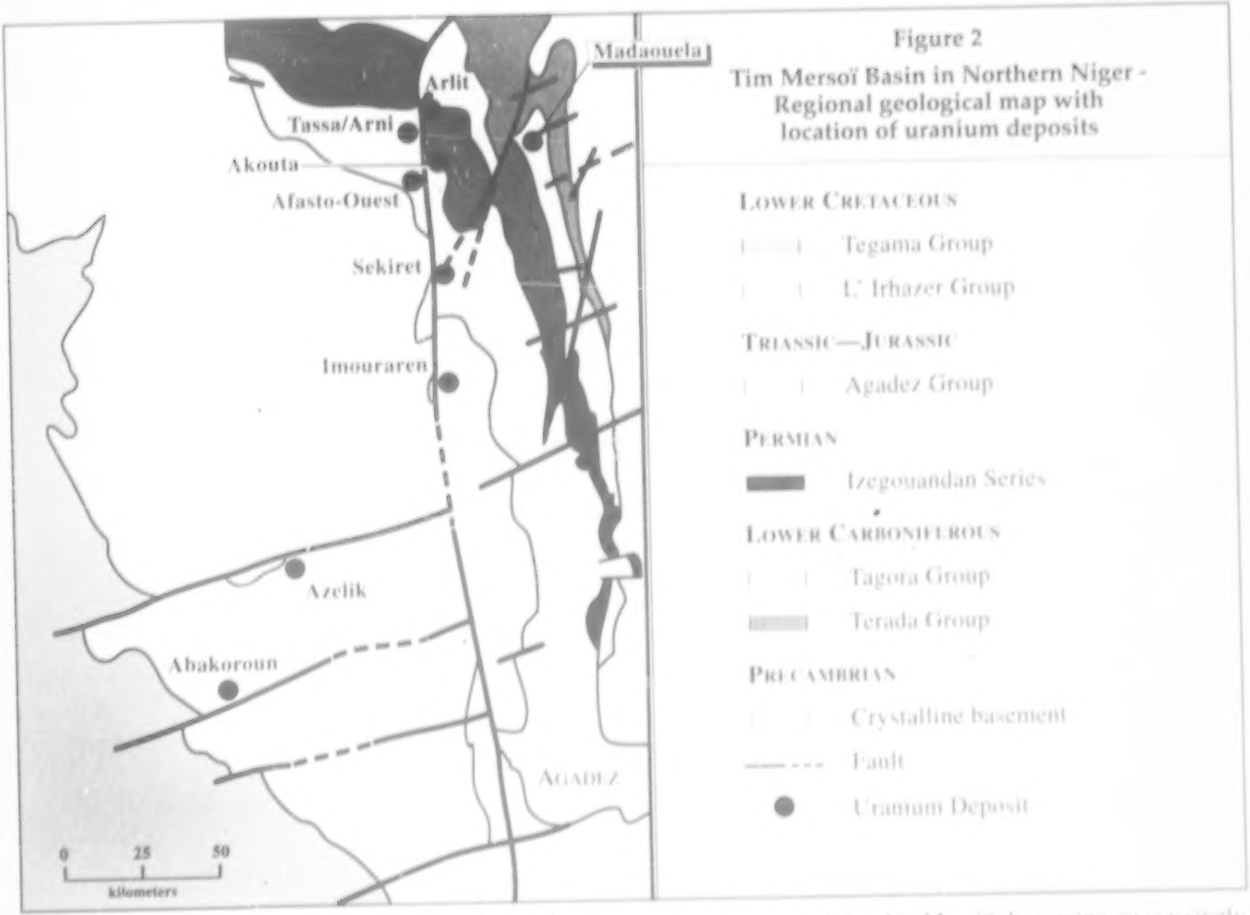
Madaouela
Arlit
Tassa/Arni
Akouta
Afasto-Ouest
Sekiret
Imouraren
Azelik
Abakoroun
AGADEZ
0
25
50
kilometers
LOWER CRETACEOUS
Tegama Group
L' Irhazer Group
TRIASSIC—JURASSIC
Agadez Group
PERMIAN
Izegouandan Series
LOWER CARBONIFEROUS
Tagora Group
Terada Group
PRECAMBRIAN
Crystalline basement
Fault
Uranium Deposit

Figure 2
Tim Mersoï Basin in Northern Niger - Regional geological map with location of uranium deposits

Carboniferous to Cretaceous age fill the Tim Mersoi Basin. The distribution of the various geologic groups within the Tim Mersoi basin is displayed in **Figure 2**, and a stratigraphic column of the uranium deposits in the basin is shown in **Figure 3**.

The sediments are composed of interstratified sequences of sandstones, arkoses, minor conglomerates, and often organic-rich claystones and shales. These sediments occur in beds ranging in size from several centimeters to tens of meters thick. Two prominent stratigraphic systems are present: a Lower to Middle Paleozoic sequence which is dominated in the uranium region by a 600 meter-thick sequence of gray Lower Carboniferous strata; and a pink sequence of Permian to Lower Cretaceous "Continental Intercalaire" (red series). Due to a sedimentological gradient, the various stratigraphic units are exposed in aureoles around the Aïr Massif, becoming successively younger with increasing distance from the massif. In general, the inclination of the sediments is shallow.

These features suggest that the basin was filled by slow sedimentation under fairly stable tectonical and climatological conditions lasting from the Upper Paleozoic into the Mesozoic Age. These conditions are considered critical for the formation and preservation of uranium deposits.

Mineralization

Uranium deposits in the Tim Mersoi Basin are essentially of tabular sandstone type, with local modification to stack-type mineralization along fractures. Uranium has been preferentially accumulated during two stratigraphic periods, the Carboniferous and Jurassic. Several formations of these periods have a remarkable uranium content.

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Figure 3 —TIM MERSOI BASIN: STRATIGRAPHIC COLUMN WITH URANIUM DEPOSIT POSITIONS

Period	Group	Series	Formation	Lithology	U Deposit
Lower Cretaceous	Tegama			Pink Sandstone	
	Irhazer	Dabla	Irhazer	Pink shale with sandy lenses	
Jurassic	Agadez		Assaouas	Pink claystone with sandy interbeds (Gelili Sandstone)	Azelik
			Tchirézrine 2	Pink crossbedded sandstone	Imouraren, Assaouas
		Wagadi	Abinky	Pink crossbedded sandstone	
			Tchirézrine 1	Pink crossbedded sandstone	
		Goufat	Mousseden	Pink crossbedded sandstone	
			Teloua 3	Pink crossbedded sandstone	
			Teloua 2	Pink crossbedded sandstone	
Triassic		Aguelai	Teloua 1	Pink crossbedded sandstone	
Permian	Izegouanda		Moradi	Pink sandy shale	
			Tamamait	Pink and gray shale	
			Tejia	Pink and gray shale	
			Izegouanda	Pink coarse-grained arkose, with calcitic matrix, and lenses of tan-pink shale Microconglomerate (quartz, chert pebbles)	
Namur-Westphalian	Tagora		Arlit (10m)	Clayey sandstone, multicolored	
			Madaouela (50m)	Alternating gray to tan sandstone and gray-black shale with vegetal debris	Abakoroun
			Tarat (50m)	Coarse- to fine-grained quartzitic sandstone with shale lenses	
Upper			UTT		
			Tschiniezogue (<70m)	Shale, argilieceous sandstone, quartzitic sandstone, greenish-gray	Arlit (Arlette, Ariège, Artois), Tassa/Arni
			Guézouman (<60m)	Medium- to coarse-grained quartzitic sandstone with clayey interbeds, light gray	
Visean	Terada		Akokan Unit		
			Talak (180m)	Tan-black to blue-green shale, fine-grained, calcitic sandstone	Akouta, Afasto-Ouest, Madaouela
Lower			Teragh (100m)	Coarse-grained sandstone silt, shale, multicolored	
	Precambrian - Lower Paleozic			Granite, metasediments	

Thickness values refer to the Arlit area.

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They include:

Lower to Middle Carboniferous Tagora Group

- Upper Visean Guézouman Formation (Akouta deposit, Madaouela and Afasto-Ouest occurrences)
- Namur - Westphalian Tarat Formation (Arlit and Tassa N' Taghalgue/Arni deposits)
- Namur - Westphalian Madaouela Formation (Abakoroun deposit)

Jurassic Agadez Group

- Tchirézrine 2 Formation (Imouraren deposit, Assaouas occurrence)
- Gelili Sandstone in Assaouas Formation (Azelik deposit)

DEPOSITS IN PRODUCTION

Arlit

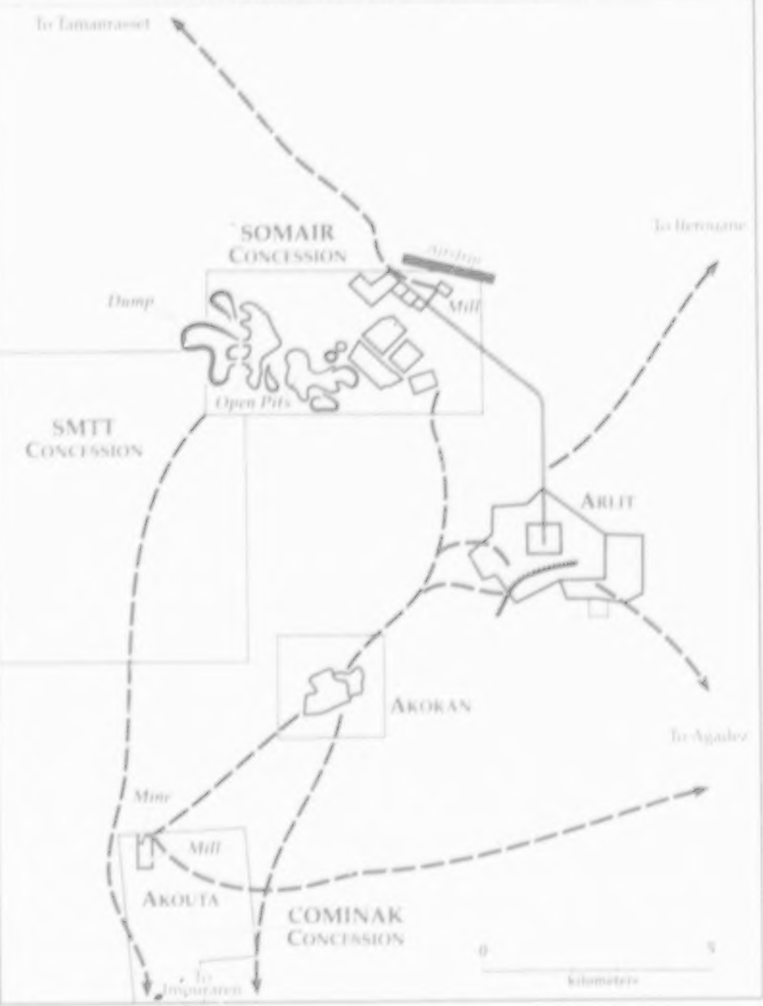
The Arlit project, located 250 km north of Agadez, is operated by Cogema. Uranium mining began in 1971, and ore has been mined from four open pits (**Figure 4**). Nominal production capacity of the Arlit mill is 6.0 million pounds U_3O_8 per year. Production peaked in 1981 at 5.5 million pounds U_3O_8, then was reduced to its present level of approximately three million pounds per year.

Geology and Mineralization

Uranium mineralization occurs within a 40 meter-thick sequence of alternating fine- to coarse-grained quartz sandstone, claystone-shale, and some conglomerate layers of the Carboniferous Tarat Formation. Individual bed sizes range from a few centimeters to ten meters thick. The strata dip subhorizontally, but with local variations. The principal rock facies is an often porous sandstone composed of quartz grains and a matrix of pyrite-bearing kaolinite-dickite and minor carbonate. Black shaley layers and lenses are intercalated in the sandstone. Vegetal organic material is abundant. These lithologies are part of an ancient river system termed the Arlit channel.

Uranium occurs in sandstone as pitchblende and coffinite, in shale as disseminated argillic-organic-uranium complexes, and in oxidized zones mainly as uranyl-vanadates. Minor amounts of molybdenum and vanadium also are present and are often closely associated with the uranium. The uranium mineralization is concentrated in the form of peneconcordant lenses or blankets with irregular boundaries in sandstone, black claystone and alternating beds of fine-grained sandstone and shale.

Figure 4
THE MINE-MILL COMPLEXES OF SOMAIR (ARLIT DEPOSIT) AND COMINAK (AKOUTA DEPOSIT)



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Three principal ore bodies are distinguished at Arlit: Arlette, Ariège, and Artois. They are separated from each other by barren ground or sub-ore grade mineralization. Their hanging walls are at a depth of 35 meters, 55 meters, and 80 meters, respectively (**Figure 5**). The ore bodies vary in thickness from 15 meters (Arlette) to 35 meters (Artois). Ore grade is almost 0.3 % U_3O_8. In addition, the Taza deposit, located nearby, was acquired from Société Minière de Tassa N'Taghalgue (SMTT) in 1986. Production in the region has gradually shifted to this higher-grade, open-pit mine, and is now the Arlit project's predominant ore source. Total resources of the Arlit project, including that already mined, amount to almost 110 million pounds U_3O_8.

Akouta

The Akouta project is located about 10 kilometers from the Arlit project. Akouta is a 250-meter deep underground mine that began operation in 1978. Nominal production capacity of the mill is 5.2 million pounds equivalent U_3O_8 per year, with actual production equalling approximately 4.7 million pounds U_3O_8 per year plus 300 metric tons of molybdenum per year. Peak production of 5.9 million pounds U_3O_8 was achieved in 1981.

Geology and Mineralization

The Akokan channel, an ancient channel composed of sediments of the Carboniferous Guézouman Formation, is the host for the Akouta deposit. The channel is incised into the Akokan Unit with the deepest parts cutting through this unit into the underlying black shales of the Talak Formation. The basal part of the channel is filled with a conglomerate horizon (Teleflak conglomerate) ranging up to five meters thick. Pebbles consist of quartz, quartzite, granite, and rhyolite, suggesting an origin from the Aïr Massif. Black claystone and phosphatic pebbles occur in minor quantities.

A 35 meter-thick fluviatile sequence resting upon the Teleflak conglomerate is the principal host for the uranium mineralization. This unit is composed of lenses of coarse- and medium-grained quartz sandstones two to three meters thick, which grade laterally and vertically into fine-grained sandstone and claystone. The sands contain thin laminae of black clay with pyritized vegetal debris. Narrow channels up to 18 meters deep dissect the mineralized sandstone unit, and locally cut down into the Akokan Unit.

The principal uranium minerals are pitchblende and coffinite. They coat quartz grains and form tiny aggregates in phyllosilicates. Pitchblende sometimes pseudomorphoses organic matter with or without preserving the original vegetal texture. Associated minerals include molybdenum (up to 4800 parts per million—ppm), vanadium (<4000 ppm), zirconium (<600ppm), and zinc (<600 ppm). Pyrite is abundant, while marcasite, melnicovite, amorphous molybdenum-sulfide (jordisite), sphalerite (iron-poor), and galena occur in minor amounts. Molybdenum accompanies high-grade uranium in strongly reduced zones. Vanadium does not form discrete minerals but occurs bound in clay minerals. Zirconium is largely incorporated in pitchblende which contains three to five percent ZrO_2. This is reflected by the high degree of correlation between uranium and zirconium throughout the deposit.

Mineralization occurs in two principal configurations:

- strata peneconcordant lenses or blankets chiefly associated with coarse- and medium-grained sandstone horizons;
- fault controlled, vertically stacked ore bodies.

Lenses are from several centimeters to a few meters thick, several meters to some ten meters wide, and up to a few hundred meters long. Stacked ore is up to 18 meters thick. Several lenses or blankets may occur superjacent to each other within a 25-meter thick lithologic profile. Ore grade at Akouta is almost 0.5 % U_3O_8; total resources, including that already mined, exceed 150 million pounds U_3O_8.

OTHER DEPOSITS IN THE TIM MERSOÏ BASIN

Niger has numerous other undeveloped deposits, all within the Tim Mersoï basin. Onarem has an interest in all Niger's uranium projects, and Cogema is also a major shareholder in most of the deposits. Additionally, organizations from Japan, Germany, Kuwait, and the United Kingdom have varying interests in some of the projects.

Carboniferous Tagora Group

Madaouela

The Madaouela deposit is located about 30 km southeast of Arlit. Two ore bodies, 300 meters apart, have been identified: Marianne and Marylin. Host rocks are sandstone and the Teleflak conglomerate of the Guézouman Formation. The sandstone consists of fine-grained quartz grains without cement and contains abundant pyrite and organic matter.

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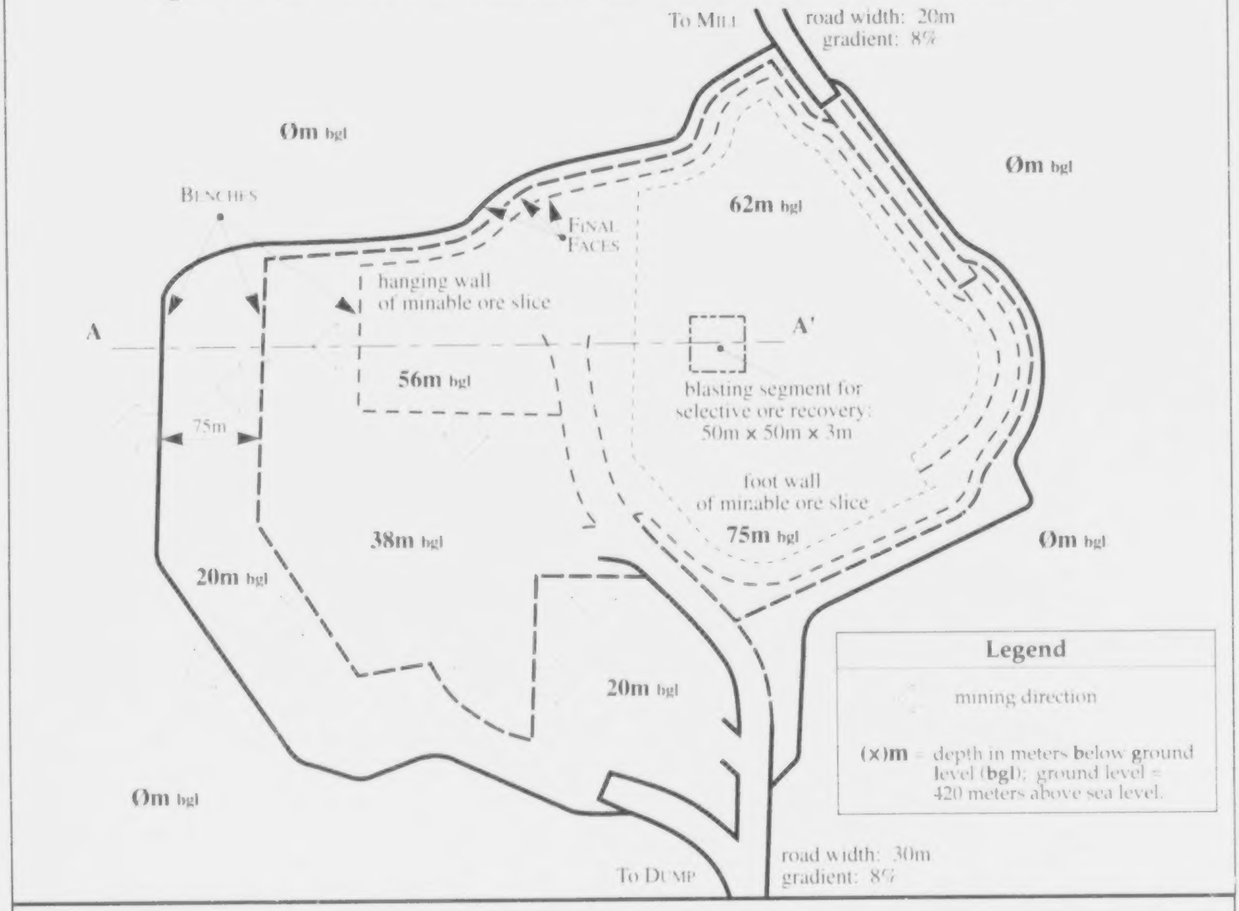
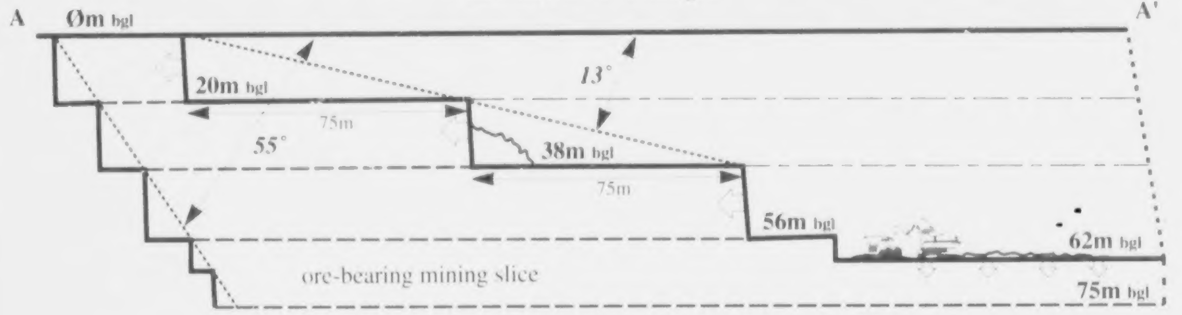
Figure 5 — SCHEMATIC OF MINING METHODS USED AT THE ARLIT PROJECT


To Mill
road width: 20m
gradient: 8%
0m bgl
0m bgl
Benches
Final Faces
62m bgl
hanging wall of minable ore slice
A
A'
56m bgl
blasting segment for selective ore recovery: 50m x 50m x 3m
75m
foot wall of minable ore slice
75m bgl
38m bgl
0m bgl
20m bgl
20m bgl
0m bgl
Legend
mining direction
(x)m = depth in meters below ground level (bgl); ground level = 420 meters above sea level.
To Dump
road width: 30m
gradient: 8%

Section A—A' Enlarged


A
0m bgl
A'
20m bgl
13°
75m
55°
38m bgl
75m
56m bgl
62m bgl
ore-bearing mining slice
75m bgl

These diagrams illustrate the open-pit mining methods used at the Arlette and Ariège deposits at the Arlit project. Blasting of the mineralized horizon is done in benches 50 meters wide, 50 meters long, and 3 meters high. Ore-grade material is selected by radiometric survey of short holes in a 2.5m x 2.5m grid. Ore calculation is done in slices 5m x 5m and 0.2m thick. Based on this data, ore is recovered by selective blasting of ore-grade and subgrade material. Approximately 40 to 50 tonnes of the mining slice will yield 14-15 tonnes of ore that can be transported to the mill.

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Uranium occurs in reduced zones as pitchblende and coffinite, closely associated with organic material. Associated minerals include sulfides of iron, molybdenum, zinc, lead, and copper. Mineralization occurs primarily as elongated lenses restricted to the basal part of the Guézouman Formation, where they rest immediately above pyritic gray to black shale of the Talak Formation. The mineralized horizon is at a depth of 40 to 120 meters below the surface. Madaouela resources total 17 million pounds U_3O_8, but recovery costs are estimated at more than $30 per pound U_3O_8.

Tassa N' Taghalgue/Arni

This deposit is located only four kilometers from Arlit. Host rocks are quartz sandstones of the Tarat Formation. Mineralization occurs at a depth of 80 meters and could be mined by open-pit methods. Resources totalling 148 million pounds U_3O_8 at a grade of 0.29 % U_3O_8 could be recovered at less than $30 per pound U_3O_8.

Afasto-Ouest

The deposit, located 15 km south of Arlit, is hosted by quartz sandstones of the Guézouman Formation. Mineralization occurs at a depth of approximately 800 meters and would require underground mining. It is estimated that resources exceeding 80 million pounds U_3O_8 at a grade of 0.29 % U_3O_8 could be recovered at a cost greater than $30 per pound U_3O_8.

Sekiret

Host rocks to the Sekiret deposit are arenaceous sediments of the Tagora Group. Mineralized sandstone lenses up to 2.9 meters thick occur at a depth of 200 meters. Resources of this deposit, located 50 km south of Arlit, amount to ten million pounds U_3O_8 at an average grade of 0.13 % U_3O_8. Recovery costs probably would exceed $30 per pound U_3O_8.

Abakoroun

The uranium of this deposit, located 200 km southwest of Arlit, is hosted in sandstones of the middle part of the Madaouela Formation. No resource figures on this deposit are published individually, but are combined with figures from the Azelik deposit.

Jurassic Agadez Group

Imouraren

The Imouraren deposit, the largest undeveloped deposit in Niger, is hosted by largely oxidized arkoses of the Upper Jurassic Tchirézrine 2 Formation. The arkoses contain zeolites but very little argillaceous matrix, and organic matter is rare. The zeolites, essentially analcime, occur finely disseminated or accumulated in layers. Fractures are filled with a kaolinite-dickite assemblage.

Principal uranium minerals are uranophane, boltwoodite, and metatyuyamunite. Associated minerals include a relatively high content of native copper and copper oxides. Limited reduced zones occur as remnants in the sediments and contain predominantly coffinite associated with native copper or chalcocite. Pitchblende is rare and accompanied by chalcopyrite.

Mineralization at this deposit, located 80 km south of Arlit, occurs in three zones over a vertical interval of 50 meters. Overburden thickness is between 100 and 110 meters. Resources total over 200 million pounds U_3O_8 at a grade of about 0.18 % U_3O_8, recoverable at an estimated cost of more than $30 per pound U_3O_8. Lower grade resources total an additional 65 million pounds U_3O_8.

Assaouas

Assaouas is a uranium occurrence in the oxidized arkoses of the Tchirézrine 2 Formation. Geologically and mineralogically, it is similar to Imouraren except that the coffinite-chalcocite association occurs in zones with remnants of "primary" hematite.

Azelik

Azelik is located about 140 km southwest of Arlit. Mineralization occurs in the Gelili sandstone which forms intercalated lenses and beds up to six meters thick within the pink clays of the Assaouas Formation. Two varieties of mineralization are distinguished. Pitchblende exists in reduced zones; it coats quartz grains and occurs as isolated aggregates in calcitic matrix or on cleavage planes of feldspar. Coffinite associates with native copper.

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In oxidized zones, two generations of uranophane prevail: francevillite and other hexavalent uranium species. Associated minerals are manganese-oxides, hematite, baryte, and rare sulfide.

Combined resources for the Azelik and Abakoroun deposits total 25 million pounds U_3O_8 recoverable at costs estimated at less than \$30 per pound U_3O_8, and over 10 million pounds U_3O_8 at greater than \$30 per pound U_3O_8. Grades range from 0.20 to 0.25 % U_3O_8.

CONCLUSION

Uranium mining is the single most important industry in the country of Niger. Its uranium resources are abundant but costly to mine. However, given uranium's importance in the country's economy, France, primarily through Cogema, likely will continue to purchase its former colony's uranium at higher prices, thereby preserving its interests in Niger and supporting the democratic moves by the country.

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NUCLEAR INDUSTRY CALENDAR

1992

March 22-25 ***Fuel Cycle Conference '92*** (OMNI Charleston Hotel, Charleston, South Carolina).
Sponsored by the U.S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

April 8-10 ***Research and Development in the Nuclear Industry*** (Peterhouse, University of Cambridge, England).
Sponsored by the Institution of Nuclear Engineers and the British Nuclear Forum.
Contact: Ms. Ipek Yigit, Manager for Public and Industrial Affairs, British Nuclear Forum; phone: 071-828-0116; Fax: 071-828-0110; Address: 22 Buckingham Gate, London, SW1E 6LB, England.

April 8-10 ***25th Japan Atomic Industrial Forum Conference*** (Pacifico Yokohama, Yokohama, Japan).
Contact: Department of Planning and International Affairs, Japan Atomic Industrial Forum, Inc., 81-3-3508-2411; Fax: 81-3-3508-2094; Address: 1-1-13 Shimbashi, Minato-ku, Tokyo 105, Japan.

April 12-16 ***8th Pacific Basin Conference*** (Taipei, Taiwan).
Sponsored by the American Nuclear Society.
Contact: ANS Meetings Department; 708-352-6611.

April 12-16 ***3rd Annual International High-Level Radioactive Waste Management Conference***
(Mirage Hotel, Las Vegas, Nevada).
Sponsored by the American Society of Civil Engineers.
Contact: ASCE; 212-705-7543; Address: 345 East 47th Street, New York, New York 10017.

April 26-28 ***INFO '92 Conference*** (OMNI Charlotte Hotel, Charlotte, North Carolina).
Sponsored by the U.S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

May 4-6 ***Nuclear Power Assembly '92*** (Capitol Hill Hyatt Regency, Washington, DC).
Sponsored by the American Nuclear Energy Council.
Contact: Diane Holmes; 202-484-2670

May 5-7 ***Annual Meeting on Nuclear Technology '92*** (City Conference Hall, Karlsruhe, Germany).
Sponsored by the German Nuclear Society and the German Atomic Forum.
Contact: Congress Office JK'92; INFORUM GmbH, Heussallee 10, W-5300 Bonn 1; Phone: 0228-507-223.

May 17-19 ***19th Annual Meeting & Int'l Conference on Nuclear Energy*** (Hotel Diplomat, Prague, Czech.).
Sponsored by World Nuclear Fuel Market.
Contact: Donna Cason; 404-447-1144; Fax: 404-447-1797.

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1992
(continued)

June 7-11	***American Nuclear Society Annual Meeting*** (Boston Marriott, Copley Place, Boston, Massachusetts). Contact: ANS Meetings Department; 708-352-6611.
June 23-24	***Nuclear Forum '92*** (Royal Garden Hotel, London, United Kingdom). Sponsored by the British Nuclear Forum. Contact: Ms. Ipek Yigit, Manager for Public and Industrial Affairs, British Nuclear Forum; phone: 071-828-0116; Fax: 071-828-0110; Address: 22 Buckingham Gate, London, SW1E 6LB, England.
Sept. 9-11	***Uranium Institute 17th Annual Symposium*** **(London, United Kingdom).** Contact: 44-71-225-0303; Fax: 44-71-225-0308.
Sept. 20-23	***International Uranium Seminar '92*** (Hyatt Regency Hotel, Lake Tahoe, Nevada). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 21-23	***2nd International Conference on Training for Operation & Maintenance in the Nuclear Industry*** (The Moat House International Hotel, Stratford-upon-Avon, United Kingdom). Sponsored by the Institution of Nuclear Engineers. Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.
Sept. 29- Oct. 1	***Crisis/Emergency Information Planners' Workshop*** (Loews L'Enfant Plaza, Washington DC) Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Oct. 18-22	***AMC Mining Convention*** (Las Vegas, Nevada) Sponsored by the American Mining Congress. Contact: AMC Convention Office; 202-861-2800; Fax: 202-861-7535.
Oct. 19-23	***International Symposium on Geological Disposal of Spent Fuel, High-level and Alpha-bearing Wastes*** (Antwerp, Belgium). Sponsored by the International Atomic Energy Agency. Contact: IAEA, P. O. Box 100, A-1400 Vienna, Austria.
Nov. 15-18	***International Nuclear Energy Forum*** (Fairmont Hotel, Chicago, Illinois). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Nov. 15-20	***American Nuclear Society Winter Meeting*** (McCormick Center Hotel, Chicago, Illinois). Contact: ANS Meetings Department; 708-352-6611.

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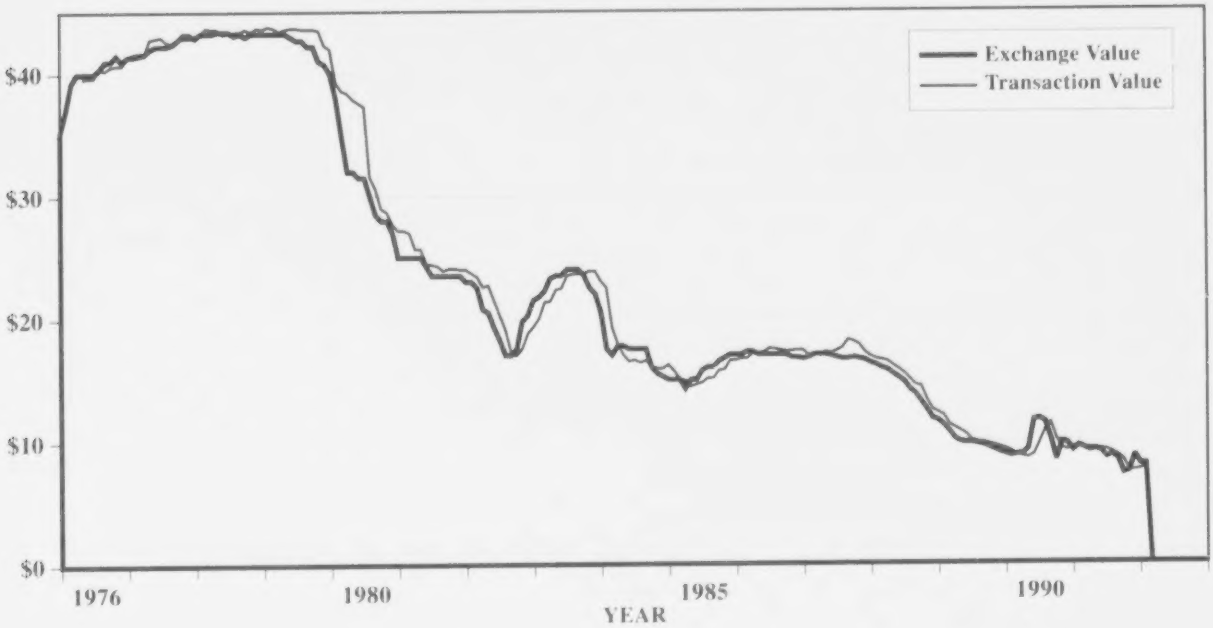
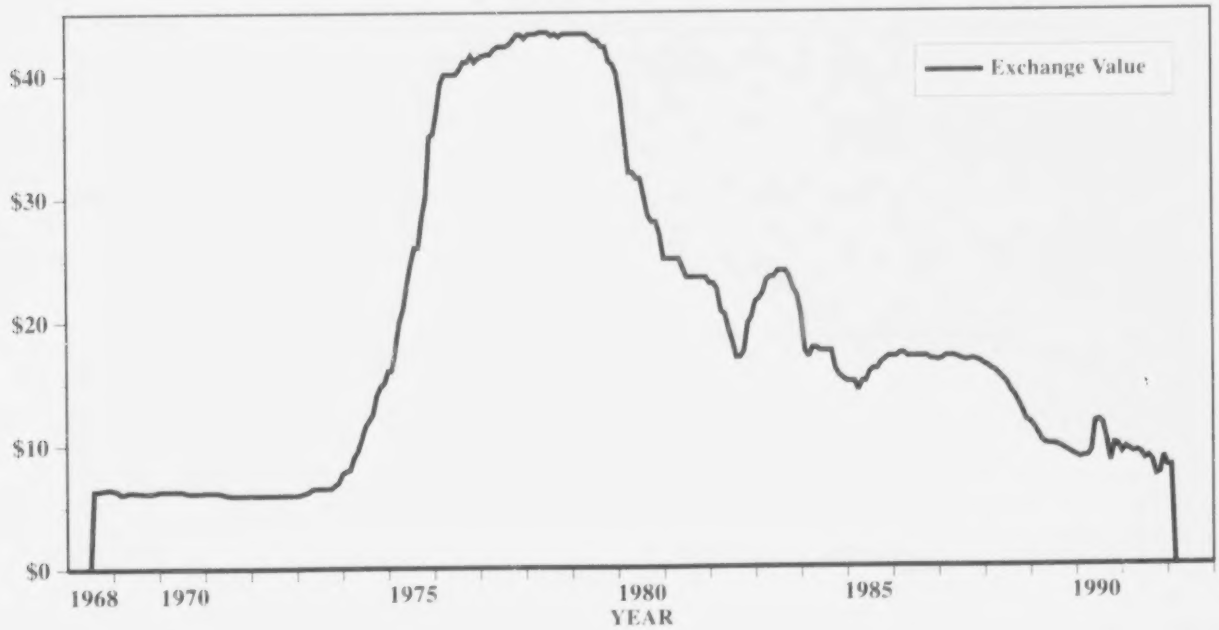
NUEXCO HISTORICAL EXCHANGE VALUE AND TRANSACTION VALUE

(in US dollars per pound U_3O_8)





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HISTORICAL MARKET VALUES

Exchange Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	9.80	9.70
1991	9.10	9.50	9.30	9.10	9.20	9.05	8.55	8.75	8.40	7.25	7.40	8.75
1992	8.00	**8.00**										

US Premium (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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UF$_6$ Values

Year	Determined as of the last day of the month indicated ($US/kg U as UF$_6$)											
Year	**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29.50	24.75	28.75	28.75
1991	27.50	27.75	27.50	27.25	27.60	27.25	25.75	26.25	25.50	22.75	22.75	26.00
1992	24.50	**24.25**										

US Premium (Relative to the UF$_6$ Value)

	Determined as of the last day of the month indicated ($US/kg U as UF$_6$)											
Year	**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

Conversion Values

	Determined as of the last day of the month indicated ($US/lb U as UF$_6$)											
Year	**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
1991	1.45	1.45	1.45	1.45	1.50	1.50	1.50	1.60	1.55	1.55	1.55	1.55
1992	1.60	**1.60**										

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HISTORICAL MARKET DATA

Transaction Values

	Determined as of the last day of the month indicated ($US/lb U_3O_8)											
Year	**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	9.30	9.15
1991	9.40	9.45	9.35	9.30	9.30	9.20	9.15	8.95	8.70	8.35	7.45	7.50
1992	7.55	**7.80**										

SWU Values

	Determined as of the last day of the month indicated ($US per SWU)											
Year	**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	51	51
1991	51	50	52	52	54	59	66	67	67	68	68	70
1992	71	**70**										

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Loan Rates

Determined as of the last day of the month indicated (Percent per Annum)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1991	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.00
1992	3.00	**3.00**										

* Float with Prime Rate

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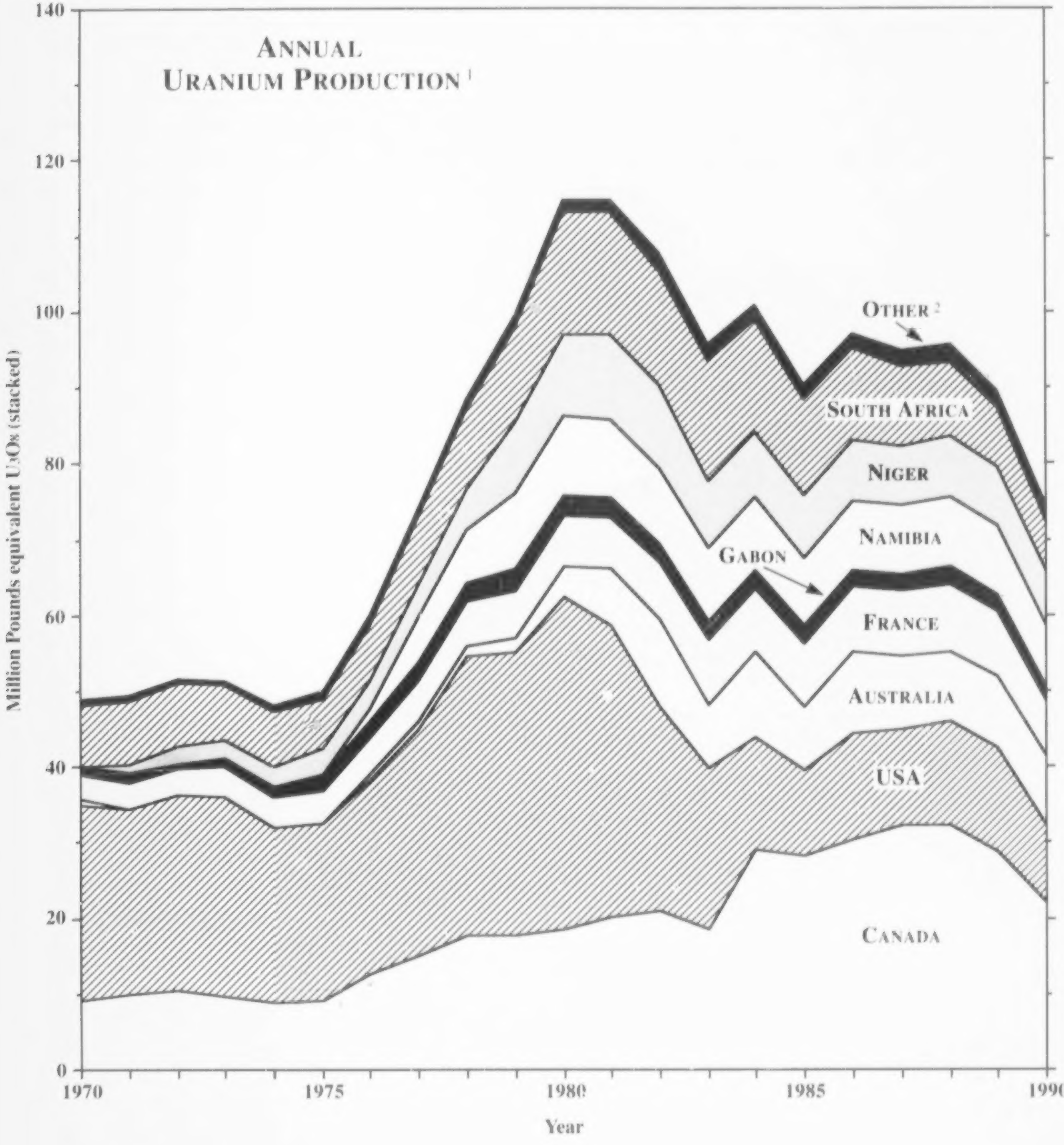

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[1] Estimated western world uranium production in 1990 totalled 74.5 million pounds equivalent U_3O_8 —
(Australia: 9.1 – Canada: 22.0 – France: 7.4 – Gabon: 1.8 – Namibia: 8.0 – Niger: 7.4 – South Africa: 6.4 – USA: 10.2 – Other[2]: 2.2)

[2] **Other** includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, former West Germany, and Yugoslavia (Slovenia)

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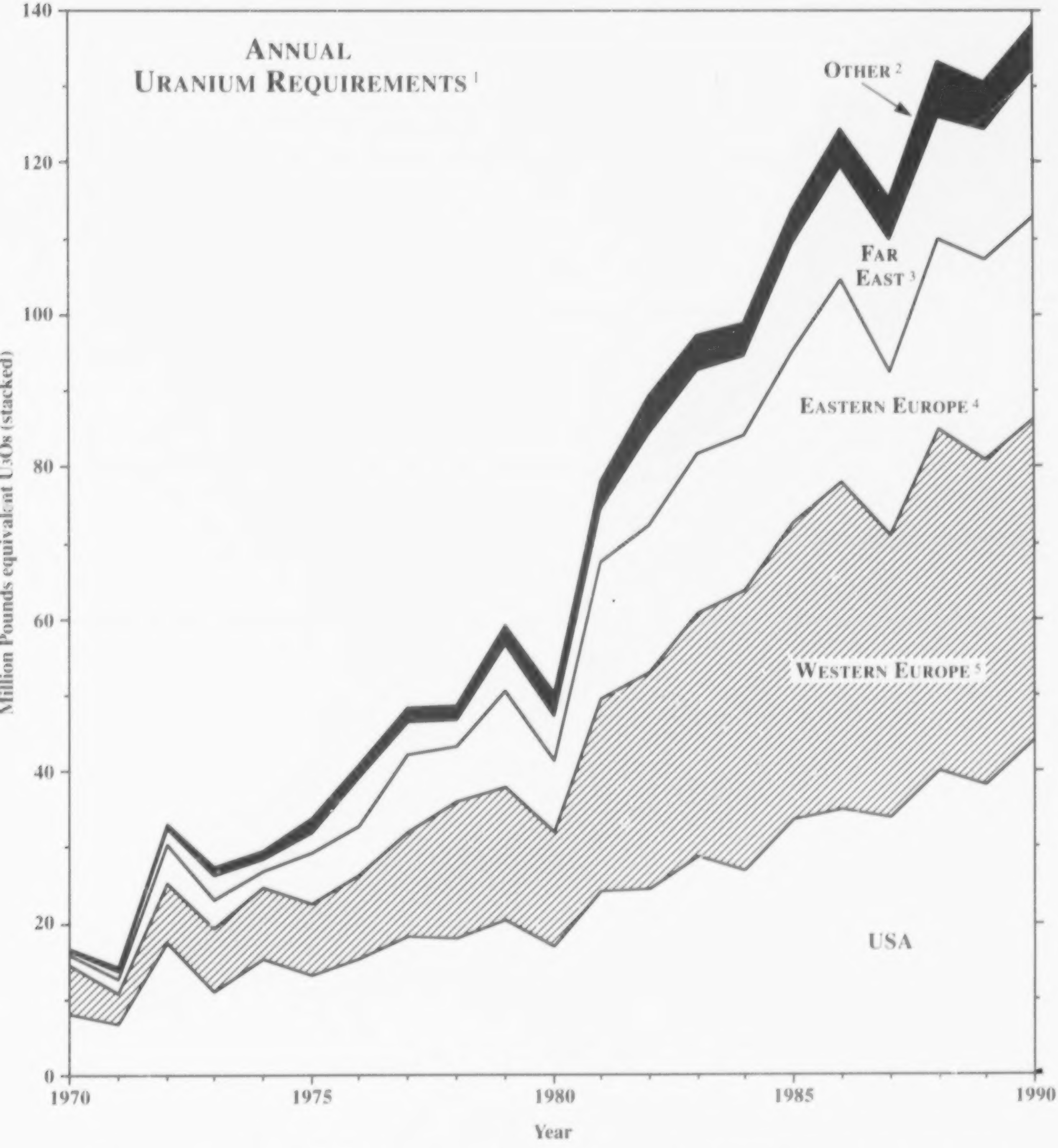

[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assay.

[2] **Other** includes: Argentina, Brazil, Canada, India, Mexico, Pakistan, and South Africa.

[3] **Far East** includes: Japan, People's Republic of China, South Korea, and Taiwan.

[4] **Eastern Europe** includes: Bulgaria, Czechoslovakia, former East Germany, Finland, Hungary, former Soviet Union, and Yugoslavia (Slovenia).

[5] **Western Europe** includes: Belgium, France, former West Germany, Italy, The Netherlands, Spain, Sweden, Switzerland, and UK.

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Australia

Year	Period[1]	Consumer Price Index[2] (1980/1981 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia[4] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[5] (June 1985=100)
1980	Avg.	95.8	83.1	—	69.6
1981	Avg.	105.0	85.9	—	76.1
1982	Avg.	116.7	89.0	—	86.4
1983	Avg.	128.5	96.9	—	89.9
1984	Avg.	133.6	98.0	—	96.0
1985	Avg.	142.6	107.3	—	100.0
1986	Avg.	155.5	101.5	—	104.9
1987	Avg.	168.7	108.9	465.88	112.9
1988	Avg.	180.9	111.8	496.90	115.4
1989	Avg.	194.6	117.0	534.65	126.0
1990	Avg.	208.7	123.4	571.43	129.7
1991	Avg.	215.5	120.1	—	—
Jan	1991	—	125.6	—	130.9
Feb	1991	—	121.5	597.70	130.9
Mar	1991	214.1	119.1	—	131.2
Apr	1991	—	117.6	—	131.4
May	1991	—	117.8	592.00	131.4
June	1991	214.4	120.4	—	131.4
July	1991	—	120.4	—	131.4
Aug	1991	—	119.9	599.50	131.7
Sept	1991	215.7	118.3	—	132.0
Oct	1991	—	118.7	—	132.0
Nov	1991	—	120.6	—	132.0
Dec	1991	217.7	121.2	—	—

P = Preliminary **R** = Revised since last month

[1] Monthly data for the period 1967 to 1990 appears in Report 278.

[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1980 to June 1981 = 100.0). Figures shown at end of quarter represent quarterly average.

[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0).

[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (Catalogue No. 6312.0). Figures for the latest fourteen months shown are subject to revision.

[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (Catalogue No. 6302.0).

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Canada

		Industrial Products Price Index: All Commodities[1] (1986 = 100)[2]	Consumer Price Index: All Items (1986 = 100)[3]	Wage-earner Data: Average Hourly Earnings (C$)[4]				
				Uranium Mines (SIC 057)	Metal Mines (SIC 051-059)	Mines, Quarries and Oil Wells (SIC 051-099)	Metal Rolling, Casting and Extruding (SIC 298)	Chemicals and Chemical Products Industries (SIC 372-379)
1980	Avg.	75.9	67.2	—.—	—.—	—.—	—.—	—.—
1981	Avg.	83.6	75.5	—.—	—.—	—.—	—.—	—.—
1982	Avg.	89.0	83.7	—.—	—.—	—.—	—.—	—.—
1983	Avg.	92.1	88.5	17.22	14.86	14.18	10.67	11.09
1984	Avg.	96.3	92.4	17.89	15.85	14.97	11.11	11.68
1985	Avg.	99.0	96.0	18.53	16.47	15.56	11.85	12.12
1986	Avg.	100.0	100.0	19.38	16.70	15.76	12.28	12.58
1987	Avg.	102.8	104.4	20.12	17.15	16.11	12.58	13.20
1988	Avg.	107.2	108.6	20.91	18.51	16.95	13.17	13.77
1989	Avg.	109.4	114.0	21.97	20.02	18.41	13.71	14.16
1990	Avg.	109.7	119.4	22.90	20.93	19.12	14.62	15.28
1991	Avg.	108.7	126.2	24.32**P**	22.25**P**	20.29**P**	14.83**P**	16.45**P**
Jan	1991	111.1	125.0	23.79	21.79	19.78	14.66	15.89
Feb	1991	110.6	125.0	25.23	22.45	20.13	14.63	16.10
Mar	1991	109.8	125.5	24.19	22.22	20.27	15.21	16.47
Apr	1991	109.1	125.5	24.77	22.50	20.31	14.63	16.68
May	1991	108.6	126.1	24.38	22.17	20.25	15.05	16.55
June	1991	108.5	126.7	23.58	22.13	19.90	14.65	16.51
July	1991	108.2	126.8	24.70	22.33	19.93	14.56	16.36
Aug	1991	107.8	126.9	23.78	22.01	20.00	14.62	16.24
Sept	1991	107.6	126.7	24.23	22.27	20.38	14.89	16.47
Oct	1991	107.6	126.5	24.40	22.26	20.53	15.06	16.55
Nov	1991	107.5	127.0	24.58**R**	22.44**R**	20.79**R**	14.85**R**	16.62**R**
Dec	1991	107.6	126.4	24.27**P**	22.46**P**	21.00**P**	15.13**P**	17.05**P**
Jan	1992	107.7	127.0	—.—	—.—	—.—	—.—	—.—

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1990 is found in Report 278.

[2] New Base Year of 1986 as of Report 266. Previous Base Year was 1981.

[3] New Base Year of 1986 as of Report 264. Previous Base Year was 1981.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1990 is found in Report 278.

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GOVERNMENT STATISTICS

South Africa

		Average Declared Working Costs per Metric Ton of Gold Ore Milled[1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ten of Gold Ore Milled[2] (March 1982 = 100)	Consumer Price Index[3] (1990 = 100)	Production Price Index All Groups[4] (1985 = 100)	Total Employment in Mining and Quarrying[5]	Total Salaries and Wages in Mining and Quarrying[5] (1,000 Rand)
							Annual Total[6]
1980	Avg.	35.50	—	25.5	55.2	709,042	2,237,689
1981	Avg.	41.87	—	29.4	62.7	722,918	2,756,928
1982	Avg.	47.23	103.9	33.7	71.4	702,041	3,181,584
1983	Avg.	51.88	115.0	37.8	79.0	700,901	3,563,282
1984	Avg.	58.95	130.3	42.2	85.6	711,511	4,134,390
1985	Avg.	68.70	151.7	49.1	100.0	724,587	4,778,612
1986	Avg.	80.18	177.9	58.2	119.6	756,637	5,767,950
1987	Avg.	95.01	223.1	67.6	136.2	751,864	6,911,395
1988	Avg.	106.69	241.1	76.2	154.1	705,355	7,774,054
1989	Avg.	116.65	273.0	87.4	177.5	700,360	8,833,934
1990	Avg.	129.37	305.3	100.0	198.9	677,742	10,193,209
1991	Avg.	136.06	324.5	115.2	221.6	—	—
							Monthly Total
Jan	1991	—	—	107.7	216.1	648,944	935,839
Feb	1991	—	—	109.0	216.9	650,948	893,373
Mar	1991	137.66	323.82	110.0	215.3	651,843	924,930
Apr	1991	—	—	111.5	216.5	639,939	887,722
May	1991	—	—	113.2	218.4	630,481	887,107
June	1991	134.65	317.23	114.0	219.3	640,908	890,595
July	1991	—	—	115.5	221.2	637,581	881,182
Aug	1991	—	—	117.1	222.8	633,699**R**	963,710**R**
Sept	1991	137.11	329.05	118.7	225.2	639,535**R**	1,014,424**R**
Oct	1991	—	—	119.8	228.3	580,942	853,933
Nov	1991	—	—	122.2	229.4	—	—
Dec	1991	134.81	327.83	123.8	230.3	—	—
Jan	1992	—	—	125.1	—	—	—

P = Preliminary **R** = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in Report 278.

[2] Page 16 of Report 178 contains description and calculation of index.

[3] Central Statistical Service, Pretoria: All income groups-weighted average, Historical Data by month appears in Report 278.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in Report 236.

[6] Annual total is shown, rather than monthly average, for indicated year.

United States

		Producer Price Index[1]				Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
		Industrial Commodities (1982 = 100)	**All Commodities (1982 = 100)**	**Consumer Price Index[2] (1982-1984 = 100)**	**GNP Implicit Price Deflator[3] (1982 = 100)**	**Metal Mining (SIC 10)**	**Primary Non-ferrous Metals (SIC 333)**	**Chemicals and Allied Products (SIC 28)**	**Electric and Electronic Equipment (SIC 36)**
1980	Avg.	88.0	89.8	82.4	85.7	10.26	10.63	8.31	6.94
1981	Avg.	97.4	98.0	90.9	94.0	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	100.0	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	103.9	12.58	13.43	10.58	8.66
1984	Avg.	103.3	103.7	103.9	107.7	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	110.9	13.38	13.74	11.57	9.46
1986	Avg.	100.0	100.2	109.6	113.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	117.7	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	121.3	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	126.3	13.59	13.72	13.09	10.05
1990	Avg.	115.8	116.3	130.7	131.5	14.10	14.36	13.54	10.32
1990	Avg.	116.5	116.5	136.2	—	14.89 **P**	14.64 **P**	14.07	10.73
Jan	1991	119.3	119.0	134.6	—	14.73	14.63	13.85	10.60
Feb	1991	117.2	117.2	134.8	—	14.80	14.55	13.81	10.59
Mar	1991	115.6	116.1	135.0	134.8	14.93	14.55	13.85	10.55
Apr	1991	115.6	116.0	135.2	—	14.85	14.56	13.96	10.63
May	1991	116.1	116.5	135.6	—	14.79	14.52	14.01	10.66
June	1991	116.1	116.4	136.0	136.1	14.88	14.51	14.05	10.74
July	1991	116.0	116.1	136.2	—	15.09	14.56	14.16	10.77
Aug	1991	116.3	116.2	136.6	—	14.82	14.64	14.06	10.78
Sept	1991	116.3 **R**	116.1 **R**	137.2	136.9	15.04	14.59	14.21	10.84
Oct	1991	116.6	116.4	137.4	—	14.94	14.75	14.25	10.78
Nov	1991	116.7	116.4	137.8	—	15.29 **R**	14.89 **R**	14.27 **R**	10.88 **R**
Dec	1991	116.1	115.9	137.9	—	14.52 **P**	14.87 **P**	14.35 **R**	10.96 **R**
Jan	1992	115.6	115.6	138.1	—	14.71 **P**	—.—	14.37 **P**	10.90 **P**

P = Preliminary **R** = Revised since last month

[1] US Bureau of Labor Statistics, Washington, DC: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents Historical data is presented in Report 278.

[2] US Bureau of Labor Statistics, Washington, DC: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in Report 278.

[3] US Department of Commerce, Washington, DC: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted. Historical data is presented in Report 278.

[4] US Bureau of Labor Statistics, Washington, DC: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in Report 278.

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Volume and Price of Uranium Deliveries To The European Community[1]

— Compiled from data published by the Euratom Supply Agency —

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price		Spot Contracts[3] Average Price	
			in ECU per pound U_3O_8	in US Dollars per pound U_3O_8	in ECU per pound U_3O_8	in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19
1990	12,800	16.7	ECU 23.08	$29.39	ECU 7.60	$ 9.68

P = Preliminary **R** = Revised since last month

[1] The twelve European Community member nations are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom: prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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US Uranium Marketing Activities Statistics

— Compiled from data published by the US Energy Information Administration [1] —

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers [2] (million pounds U_3O_8)	Average Price of Delivered Uranium [2] (\$/lb. U_3O_8)	Quantity of Uranium Imported [3] (million pounds U_3O_8)	Average Price of Imported Uranium (\$/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	\$16.10	3.6	n/a	1.2
1977	29.9	27.8	\$19.75	5.6	n/a	4.0
1978	37.0	31.6	\$21.60	5.2	n/a	6.8
1979	37.5	33.0	\$23.85	3.0	n/a	6.2
1980	43.7	35.0	\$28.15	3.6	\$43.10	5.8
1981	38.5	32.6	\$34.65	6.6	\$32.90	4.4
1982	26.9	23.5	\$38.37	17.1	\$25.19	6.2
1983	21.2	24.2	\$38.21	8.2	\$26.16	3.3
1984	14.9	22.5	\$32.65	12.5	\$21.86	2.2
1985	11.3	21.7	\$31.43	11.7	\$20.08	5.3
1986	13.5	18.9	\$30.01	13.5	\$20.07	1.6
1987	13.0	20.8	\$27.37	15.1	\$19.14	1.0
1988	13.1	17.6	\$26.15	15.8	\$19.03	3.3
1989	13.8	18.4	\$19.56	13.1	\$16.75	2.1
1990	8.9	20.5	\$15.70	23.7	\$12.55	2.0

P = Preliminary **R** = Revised since last month

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity*.
1984-1990: Energy Information Administration, *Uranium Industry Annual*.

[2] Data for 1976-1981 includes both domestic utilities and agents.

[3] Includes imports by domestic utilities and domestic suppliers.

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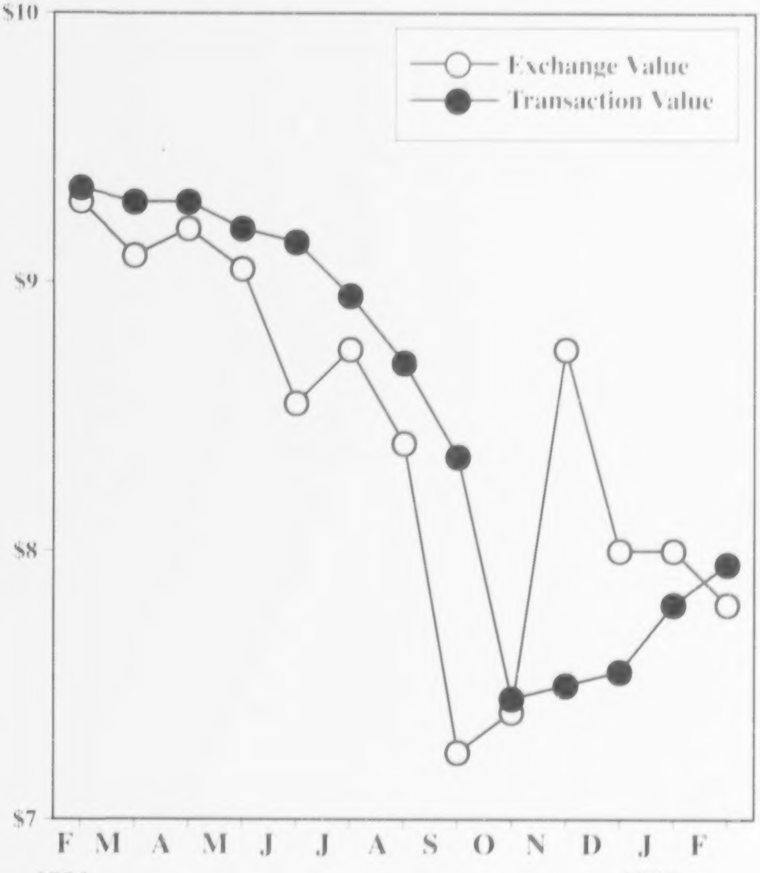

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- **Commerce in a Changing World**

CONCORD/NUEXCO Chairman Oren L. Benton presented a speech at the USCEA Fuel Cycle '92 Conference commenting on free trade and the anti-dumping petition against the former Soviet Union. This article is a slightly edited version of that speech.

Focus 29
- **Spain**

Spain's nuclear power program has had its share of successes and challenges. The country currently operates nine reactors totalling over 7,100 MWe of capacity, yet four reactors remained mothballed at advanced stages of construction by virtue of a government-imposed moratorium.

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To Our Readers

CONCORD/NUEXCO is pleased to announce a realignment of executive responsibilities within the company. Earl E. Hoellen has assumed the position of Vice Chairman and Chief Executive Officer of CONCORD's Trading and Marketing Business Unit, including NUEXCO. Earl previously had been President and Chief Operating Officer of NUEXCO, and brings experience and strong leadership to this expanded role. As CEO, Earl will expand his responsibilities in NUEXCO including its overall strategic direction and organizational planning as well as development of the business unit as a whole. Oren L. Benton will retain the title of Chairman and will now concentrate on matters of major significance to CONCORD's international activities and special projects of NUEXCO and CONCORD in the nuclear fuel industry.

James J. Graham has assumed the position of President and Chief Operating Officer of NUEXCO, including NUEXCO Trading Corporation, and will work closely with Earl Hoellen. Jim's extensive management experience and intimate knowledge of the uranium industry make him exceptionally qualified to manage NUEXCO in its day-to-day operations.

NUEXCO also is pleased to announce that Treva E. Klingbiel has been named President of the NUEXCO Information Services division of NUEXCO. Treva has demonstrated a commitment to excellence for information and consulting services, and will continue to explore growth opportunities for NUEXCO in this area.

These realignments will enable NUEXCO to adapt more readily to changes in the worldwide market and to pursue new growth opportunities, while continuing to provide our traditional services with greater resources and increased flexibility.

* * *

We would like to call your attention to the article in this month's report entitled "Commerce in A Changing World". The article is a reprint of the speech given by CONCORD/NUEXCO Chairman Oren L. Benton at the USCEA Fuel Cycle '92 Conference. In the speech, Mr. Benton discusses his views on free trade, and on the anti-dumping petition filed against the former Soviet Union. He invites comments from our readers regarding the continued publication of the NUEXCO Market Values. He also announces the formation of First International Reserve of Materials AG (FIRM), an organization to hold, manage, and use inventories of uranium in all forms of multi-national origin in various western countries.

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NUEXCO

MARKET REVIEW

Market Values Summary

NUEXCO Market Values	This Report March 31, 1992	Last Report February 29, 1992	12 Months Ago March 31, 1991
EXCHANGE VALUE [1]	**$7.85** / lb equivalent U_3O_8	$8.00	$9.30
UF_6 VALUE [2]	**$24.00** / kg U as UF_6	$24.25	$27.50
LOAN RATE [3]	**3.0%** / annum	3.0%	3.5%
CONVERSION VALUE [4]	**$1.60** / lb U as UF_6	$1.60	$1.45
SWU VALUE [5] **(0.3 w/o tails assay)**	**$69** / SWU	$70	$52
TRANSACTION VALUE [6]	**$7.95** / lb equivalent U_3O_8	$7.80	$9.35
Transactions	**26**	23	19
Months	**3**	3	3
Millions of Pounds	**5.7**	6.6	3.0

DEFINITIONS

1 The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

2 The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

3 The **Loan Rate** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

4 The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

5 The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

6 The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

a) Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;

b) At least ten transactions;

c) Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.
- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.
- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight-percent U^{235} and a product assay of 3.0 weight-percent U^{235}, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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MARCH MARKET REVIEW

(as of March 31, 1992)

OVERVIEW

The uranium market weakened in March, resulting in a $0.15 drop of the Exchange Value, to $7.85 per pound U_3O_8. Demand was fairly strong during the month, but competition among numerous sellers forced a slight price decline by month end. The UF_6 Value also dropped, falling to $24.00 per kgU as UF_6.

Fifteen near-term uranium transactions were reported, totalling 3.8 million pounds equivalent U_3O_8. The total includes eight concentrates sales, four UF_6 sales, and three sales of enriched uranium product (EUP). March was the most active month thus far in 1992, and brings the first quarter market volume total to 6.6 million pounds equivalent U_3O_8 (**Table 1**). This outpaces the 1991 first quarter level of five million pounds, but lags 1990's record first-quarter volume of eleven million pounds.

The Conversion Value was unchanged at $1.60 per pound U as UF_6. One near-term conversion transaction was reported for a large quantity of conversion services.

The Loan Rate also was unchanged, remaining at 3.0 percent per annum. In the one loan reported during March, an intermediary borrowed a moderate quantity of concentrates.

The SWU Value slipped one dollar, to $69 per SWU. Four near-term enrichment transactions were reported, totalling almost 200 thousand SWU. Three of the sales involved SWU contained in EUP.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	March 1992		Year-to-Date	
	No. of Sales	Volume[1]	No. of Sales	Volume[1]
Concentrates	8	2.3	23	4.9
Natural UF_6	4	0.8	5	0.9
EUP	3	0.7	5	0.8
Total[2]	**15**	**3.8**	**33**	**6.6**

[1] Million pounds equivalent U_3O_8
[2] Due to independent rounding, columns may not equal total.

NATURAL URANIUM AND CONVERSION

The NUEXCO **Exchange Value** dropped $0.15 at the end of March, to **$7.85** per pound U_3O_8. As evidenced by the relatively high volume of sales, demand was quite strong during the month, but competition among numerous sellers precluded a price increase, and as demand tapered off, forced market prices lower at month end.

While sellers were quite active during March, they were not extraordinarily aggressive, as uncertainty regarding the outcome of the anti-dumping investigation against the former Soviet Union continued. The March 26 announcement that the date for the preliminary decision on the case had been postponed to May 18, eased this uncertainty temporarily.

Eight near-term concentrates sales were reported, totalling 2.3 million pounds equivalent U_3O_8. Nearly all were concluded at or near the March 31, 1992 Exchange Value. Producers made four purchases; utilities, two; and intermediaries, two. Intermediaries and producers made all but one of the sales. Geographically, about half the sales and purchases were made by US-based companies.

* * *

The **UF_6 Value** also decreased, sliding $0.25, to **$24.00** per kgU as UF_6. Sellers eager to capture the somewhat limited UF_6 demand led to the price decline. Activity in the UF_6 market increased in March, as buyers considered offers for both UF_6 and concentrates, as opposed to previous months when concentrates were the preferred form.

Four natural UF_6 transactions were reported, totalling some 800 thousand pounds equivalent U_3O_8. Year-to-date UF_6 sales volume totals more than 900 thousand pounds, virtually equal to last year's level at this time. Intermediaries were the sellers in all four transactions; buyers primarily were utilities. US entities purchased more than half the volume.

* * *

In the **long-term uranium market**, three transactions were reported. Utilities purchased 4.9 million pounds equivalent U_3O_8 in the form of concentrates from two producers and an intermediary. Deliveries range from 1993 through 2000. Activity has increased recently in the long-term market, and at month end, six utilities were evaluating offers for up to 24 million pounds equivalent U_3O_8 for delivery through 2004.

Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply[1]	Active Demand[1]
• Uranium (thousand lbs equivalent U_3O_8)	7,480	1,100
• Supply/Demand Ratio:	6.8	
• Loan (thousand lbs equivalent U_3O_8)	10,565	500
• Conversion (thousand lbs U as UF_6)	3,740	1,875
• SWU (thousand SWUs)	530	35

[1] Supply and Demand tables in the Market Review section of this Report provide details for each category.

* * *

The **Transaction Value** climbed $0.15, to **$7.95** per pound U_3O_8 based on 26 transactions over three months involving 5.7 million pounds equivalent U_3O_8.

* * *

Uranium demand was strong during the month, but uranium supply rose significantly as well, meeting all emerging demand and still ending March more than three million pounds higher than at the end of February. **Active uranium supply** as of March 31 was **7.5** million pounds equivalent U_3O_8. In contrast, **active uranium demand** ended the month about one million pounds lower than its previous month-end level, falling to **1.1** million pounds equivalent U_3O_8. The resultant **supply/demand ratio** was **6.8**.

* * *

The **Loan Rate** remained unchanged at **3.0** percent per annum. Natural uranium loan supply continues to overwhelm loan demand (**Table 2**), and has kept the Loan Rate at its present level. Only one loan was reported, in which an intermediary borrowed a moderate quantity of concentrates.

* * *

The **Conversion Value** also was unchanged, remaining at **$1.60** per pound U as UF_6. Although uncertainty concerning the availability of future conversion supply continued, limited secondary market demand stayed any price increase during March. One conversion transaction was reported: a primary converter sold a large quantity of conversion services for delivery later this year.

* * *

ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

The March 31, 1992, **SWU Value** slipped one dollar, to **$69** per SWU. Increased competition among sellers led to the slight decrease. The minor decreases in the SWU Value the past two months may not signal a reversal of the recent upward price trend, but rather, just a temporary stall in the market.

Four near-term enrichment transactions were reported in March, totalling almost 200 thousand SWU. Three of these sales involved SWU contained in EUP, and also contained almost 700 thousand pounds equivalent U_3O_8 as their feed component. All four SWU purchases were made by utilities, three from the USA and one from Europe. In addition, one longer term enrichment sale was reported, in which a European utility purchased a large quantity of SWU for delivery in late 1993.

Table 3
ENRICHMENT PRICES
(March 31, 1992)

Prices	This Month Report 284	Last Month Report 283	12 Months Ago Report 272
NUEXCO SWU Value ($US per SWU)	69	70	52
US DOE SWU prices: ($US per SWU)			
USC	121.50[1]	121.50[1]	117.85[2]
AFC	153.00[3]	153.00[3]	153.00[3]
Requirements	157.00[3]	157.00[3]	157.00[3]
Incentive Price (IP2)	104.67[4]	104.67[4]	100.68[5]
Calculated worth of enriched UF_6[6]: ($US per KgU as UF_6)			
2.0 $^w/_o$ U^{235}	217	220	202
2.5 $^w/_o$ U^{235}	304	309	279
3.0 $^w/_o$ U^{235}	394	400	359
3.5 $^w/_o$ U^{235}	487	494	440
4.0 $^w/_o$ U^{235}	580	589	522
4.5 $^w/_o$ U^{235}	676	686	605

[1] Effective 10/1/91.
[2] Effective 10/1/89 to 9/30/91.
[3] Effective since 10/1/84.
[4] Provisional IP2 for FY92: Effective 10/1/91 to 9/30/92, for up to 30% of annual requirements.
[5] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.
[6] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 $^w/_o$ ^{235}U tails assay.

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RECENT TRANSACTIONS

Uranium Sales [1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range [2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5381	1992	50-100	98-102	Producer	Intermediary	
5384	1992	301-600	98-102	Producer	Intermediary	UF_6
5385	1992	101-300	98-102	Utility	Intermediary	UF_6
5386	1992	50-100	98-102	Producer	**R**	
5387	1992	101-300	98-102	Utility	Intermediary	UF_6
5388	1992	101-300	103-110	Utility	**R**	
5390A	1992	Less Than 50	See Remarks	Utility	**R**	Contained in EUP
5392	1992	101-300	90-97	Utility	Intermediary	
5393	1993	301-600	98-102	Utility	Intermediary	
5394	1992	301-600	98-102	Intermediary	Producer	
5395	1992	101-300	98-102	Producer	Intermediary	
5396A	1992	101-300	See Remarks	Utility	Intermediary	Contained in EUP
5398	1992	301-600	98-102	Producer	**R**	
5400A	1992	301-600	See Remarks	Utility	Intermediary	Contained in EUP
5401	1992	Less Than 50	Above 110	Intermediary	Intermediary	UF_6
5403	1992	301-600	98-102	Intermediary	Producer	
5404	1994-1999	1,001-3,000	See Remarks	Utility	Producer	Base Escalated
5405	1994-2000	1,001-3,000	See Remarks	Utility	Producer	Price Related to Market

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Exchange Value or UF_6 Value. The endpoints of each range are included within that range.

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RECENT TRANSACTIONS

Natural Uranium Loans[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Loan Rate	Borrower	Lender	Remarks
5402	1992	301-600	**R**	Intermediary	Producer	

Conversion Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range[2] of Current Conversion Value	Buyer	Seller	Remarks
5382	1992	1,001-3,000	**R**	**R**	Converter	

Enrichment Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity[3] (thousand SWU)	Price Within Percentage Range[2] of Current SWU Value[4]	Buyer	Seller	Remarks
5389	1993	101-300	103-110	Utility	Intermediary	
5390B	1992	Less Than 50	See Remarks	Utility	**R**	Contained in EUP
5391	1992	Less Than 50	98-102	Utility	**R**	
5396B	1992	50-100	See Remarks	Utility	Intermediary	Contained in EUP
5400B	1992	50-100	See Remarks	Utility	Intermediary	Contained in EUP

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[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., **X** dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

Uranium Supply

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8)		Delivery Period	Remarks
	Spot or Near-term[1]	Intermediate or Long-term[2]		
AVAILABLE TO PURCHASE:				
ACTIVE				
91-1505	500	—	1992	
91-1506	750	—	1992	U_3O_8/UF_6
91-1507	500	—	1992	
91-1511*	1,300	—	1992	UF_6/UF_6e
91-1512	785	—	1992	UF_6
92-1087*	2,000	—	1992	
92-1501A	645	—	1992	UF_6e
92-1509*	500	—	1992	UF_6
90-1231	500	500 per year	1992-1995	
91-1268	—	600 per year	1992-1999	
TOTAL	**7,480**			
INACTIVE	**500**			
AVAILABLE TO LOAN:				
ACTIVE				
91-1084*	2,500	—	—	U_3O_8
92-1008*	500	—	—	UF_6
92-1017	900	—	—	U_3O_8
92-1060	915	—	—	UF_6
92-1072*	1,570	—	—	UF_6
92-1074*	1,000	—	—	U_3O_8
92-1075*	500	—	—	U_3O_8
92-1076*	500	—	—	U_3O_8
92-1077*	180	—	—	UF_6
92-1503	2,000	—	—	U_3O_8
TOTAL	**10,565**			
INACTIVE	**1,000**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month. 92-1502

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SUPPLY AND DEMAND

Uranium Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
INQUIRIES TO PURCHASE:				
ACTIVE				
92-1073*	200	—	1992	
92-1091*	500	—	1992	U_3O_8/UF_6
92-1098*	200	—	1992	
92-1117*	200	—	1992	
91-1118	—	300 per year	1993-1998	U_3O_8/UF_6
91-1184	—	350 per year	1993-1997	
91-1290	—	310 per year	1995-1999	U_3O_8/UF_6
91-1294	—	250 per year	1996-2000	
92-1015	—	1,300 per year	1995-2004	
92-1032	—	200 per year	1996-1998	U_3O_8/UF_6
92-1064*	—	100 per year	1993-1996	U_3O_8/UF_6
91-1197	—	2,210	1992-1997	U_3O_8/UF_6
91-1227A	—	60	1992-1994	UF_6e
91-1267*	—	350	1993	UF_6
91-1283	—	5,225	1994-2000	U_3O_8/UF_6
92-1030	—	5,500	1992-1993	U_3O_8/UF_6
TOTAL	**1,100**			
INACTIVE	**2,290**			
INQUIRIES TO BORROW:				
ACTIVE				
92-1505	500	—	—	U_3O_8/UF_6
TOTAL	**500**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 91-1232A, 91-1247, 92-1000, 92-1043, 92-1047, 92-1059A, 92-1061, 92-1063

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SUPPLY AND DEMAND

Conversion Supply and Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF6) Within 3 Years[1]	Beyond 3 Years[1]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1500	440	—	1992	
91-1501	440	—	1992	
92-1506	1,100	—	1992	
92-1507	1,100	—	1992	
92-1510*	660	—	1992	
TOTAL	**3,740**			
INACTIVE	*None reported*			
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1275*	620	—	1992	
92-1068*	155	—	1992	
92-1508	1,100	—	1992	
TOTAL	**1,875**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 91-1299

SUPPLY AND DEMAND

SWU Supply And Demand

NUEXCO Project Number	Quantity (Thousand SWUs)		Delivery Period	Remarks
	Spot or Near-term[1]	Intermediate or Long-term[2]		
AVAILABLE FOR SALE:				
ACTIVE				
91-1509	200	—	1992	
91-1515	200	—	1992	
92-1501B	130	—	1992	UF$_6$e
TOTAL	**530**			
INACTIVE	**685**			
INQUIRIES TO PURCHASE:				
ACTIVE				
92-1079*	35	—	1992	
90-1196	—	60 per year	1995 on	
91-1142	—	75 per year	1995-2000	
92-1016	—	170 per year	1996-2006	
91-1152	—	2,700	1995-2001	
91-1171	—	560	1995-1998	
91-1227B	—	35	1992-1994	UF$_6$e
91-1250	—	45	1993	UF$_6$e
92-1024	—	12	1993	
TOTAL	**35**			
INACTIVE	**185**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 91-1232B, 92-1031, 92-1035, 92-1059B

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Exchange Value[1]

	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
Country (currency)	**This Month (Mar 31, 1992)**	**Last Month (Feb 29, 1992)**	**12 Months Ago (Mar 31, 1991)**	**This Month (Mar 31, 1992)**	**Last Month (Feb 29, 1992)**	**12 Months Ago (Mar 31, 1991)**
Australia (dollar)	10.19	10.61	12.00	26.50	27.59	31.20
Belgium (franc)	265.65	269.91	326.43	690.63	701.69	848.65
Canada (dollar)	9.34	9.46	10.77	24.27	24.60	28.01
EC (ecu)	6.32	6.41	7.75	16.42	16.66	20.15
Finland (markka)	35.21	36.03	37.48	91.53	93.66	97.45
France (franc)	43.75	44.60	53.68	113.73	115.95	139.56
Germany (mark)	12.90	13.11	15.86	33.54	34.09	41.24
Italy (lira)	9,727	9,840	11,805	25,289	25,582	30,690
Japan (yen)	1,042	1,035	1,314	2,709	2,692	3,415
Netherlands (guilder)	14.53	14.75	17.88	37.77	38.36	46.48
So. Africa (comm. rand)	22.56	22.75	25.40	58.66	59.15	66.04
So. Korea (won)	6,082	6,028	6,749	15,812	15,672	17,547
Spain (peseta)	815.50	826.28	983.09	2,120	2,148	2,556
Sweden (krona)	46.84	47.56	57.27	121.77	123.65	148.88
Switzerland (franc)	11.77	11.90	13.52	30.60	30.95	35.15
Taiwan (dollar)	198.02	198.40	250.36	514.80	515.79	650.87
UK (pound)	4.52	4.56	5.34	11.76	11.85	13.89
US (dollar)	7.85	8.00	9.30	20.41	20.80	24.18

Transaction Value[1]

	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
Country (currency)	**This Month (Mar 31, 1992)**	**Last Month (Feb 29, 1992)**	**12 Months Ago (Mar 31, 1991)**	**This Month (Mar 31, 1992)**	**Last Month (Feb 29, 1992)**	**12 Months Ago (Mar 31, 1991)**
Australia (dollar)	10.32	10.35	12.06	26.84	26.90	31.37
Belgium (franc)	269.04	263.16	328.19	699.43	684.15	853.21
Canada (dollar)	9.45	9.23	10.83	24.58	23.99	28.16
EC (ecu)	6.40	6.25	7.79	16.63	16.24	20.25
Finland (markka)	35.66	35.13	37.68	92.70	91.32	97.97
France (franc)	44.30	43.49	53.97	115.18	113.05	140.31
Germany (mark)	13.06	12.78	15.95	33.97	33.24	41.46
Italy (lira)	9,851	9,594	11,868	25,611	24,943	30,855
Japan (yen)	1,055	1,009	1,321	2,744	2,624	3,433
Netherlands (guilder)	14.71	14.39	17.97	38.25	37.40	46.73
So. Africa (comm. rand)	22.85	22.18	25.54	59.41	57.67	66.40
So. Korea (won)	6,159	5,877	6,786	16,013	15,280	17,641
Spain (peseta)	825.89	805.62	988.37	2,147	2,094	2,570
Sweden (krona)	47.43	46.37	57.57	123.32	120.56	149.68
Switzerland (franc)	11.92	11.61	13.59	30.99	30.18	35.34
Taiwan (dollar)	200.54	193.44	251.70	521.36	502.90	654.37
UK (pound)	4.58	4.44	5.37	11.91	11.55	13.97
US (dollar)	7.95	7.80	9.35	20.67	20.28	24.31

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[1] As of May 1991 Report #273; calculated using currency exchange rates **for** the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273; calculated using currency exchange rates published in *The Wall Street Journal* **on** the last business day of the month.

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Conversion Value[1]

	per lb U as UF_6			per kg U as UF_6		
Country (currency)	This Month (Mar 31, 1992)	Last Month (Feb 29, 1992)	12 Months Ago (Mar 31, 1991)	This Month (Mar 31, 1992)	Last Month (Feb 29, 1992)	12 Months Ago (Mar 31, 1992)
Australia (dollar)	2.08	2.12	1.87	4.58	4.68	4.12
Belgium (franc)	54.15	53.98	50.90	119.37	119.01	112.20
Canada (dollar)	1.90	1.89	1.68	4.19	4.17	3.70
EC (ecu)	1.29	1.28	1.21	2.84	2.83	2.66
Finland (markka)	7.18	7.21	5.84	15.82	15.89	12.88
France (franc)	8.92	8.92	8.37	19.66	19.67	18.45
Germany (mark)	2.63	2.62	2.47	5.80	5.78	5.45
Italy (lira)	1,983	1,968	1,841	4,371	4,339	4,058
Japan (yen)	212.40	207.07	204.80	468.26	456.50	451.51
Netherlands (guilder)	2.96	2.95	2.79	6.53	6.51	6.15
So. Africa (comm. rand)	4.60	4.55	3.96	10.14	10.03	8.73
So. Korea (won)	1,239	1,206	1,052	2,733	2,658	2,320
Spain (peseta)	166.22	165.26	153.28	366.44	364.33	337.92
Sweden (krona)	9.55	9.51	8.93	21.05	20.97	19.68
Switzerland (franc)	2.40	2.38	2.11	5.29	5.25	4.65
Taiwan (dollar)	40.36	39.68	39.03	88.98	87.48	86.06
UK (pound)	0.92	0.91	0.83	2.03	2.01	1.84
US (dollar)	1.60	1.60	1.45	3.53	3.53	3.20

SWU Value And UF_6 Value[1]

	SWU Value at 0.30 w/o Tails Assay			UF_6 Value per kg U as UF_6		
Country (currency)	This Month (Mar 31, 1992)	Last Month (Feb 29, 1992)	12 Months Ago (Mar 31, 1991)	This Month (Mar 31, 1992)	Last Month (Feb 29, 1992)	12 Months Ago (Mar 31, 1991)
Australia (dollar)	89.61	92.88	67.10	31.17	32.17	35.48
Belgium (franc)	2,335	2,362	1,825	812.18	818.15	965.25
Canada (dollar)	82.05	82.81	60.24	28.54	28.69	31.86
EC (ecu)	55.51	56.07	43.33	19.31	19.42	22.91
Finland (markka)	309.46	315.24	209.58	107.64	109.21	110.84
France (franc)	384.53	390.25	300.16	133.75	135.20	158.74
Germany (mark)	113.39	114.74	88.69	39.44	39.75	46.90
Italy (lira)	85,502	86,101	66,007	29,740	29,828	34,907
Japan (yen)	9,160	9,059	7,345	3,186	3,138	3,884
Netherlands (guilder)	127.68	129.10	99.96	44.41	44.73	52.86
So. Africa (comm. rand)	198.33	199.09	142.04	68.99	68.97	75.12
So. Korea (won)	53,459	52,747	37,739	18,595	18,273	19,958
Spain (peseta)	7,168	7,230	5,497	2,493	2,505	2,907
Sweden (krona)	411.69	416.17	320.20	143.20	144.17	169.33
Switzerland (franc)	103.46	104.17	75.60	35.99	36.09	39.98
Taiwan (dollar)	1,741	1,736	1,400	605.40	601.39	740.30
UK (pound)	39.75	39.87	29.88	13.82	13.81	15.80
US (dollar)	69.00	70.00	52.00	24.00	24.25	27.50

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[1] As of May 1991 Report #273: calculated using currency exchange rates **for** the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273: calculated using currency exchange rates published in *The Wall Street Journal* **on** the last business day of the month.

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RECENT DEVELOPMENTS

USCEA

USCEA FUEL CYCLE '92

The US Council for Energy Awareness sponsored the Fuel Cycle '92 conference in Charleston, South Carolina on March 22-25, 1992. Over 250 participants attended, 17 papers were presented, and a panel discussion was held. The theme of the conference was navigation of the changing international commercial nuclear fuel cycle. Brief summaries of selected papers and the panel discussion follow.

Independence and Openness in Regulation of Nuclear Waste

Ivan Selin, Chairman of the US Nuclear Regulatory Commission (NRC), related that openness with the public is imperative to the understanding, acceptance, and support of nuclear power. He emphasized that NRC independence in regulatory actions is essential to public confidence in safe, efficient regulation of nuclear material throughout the fuel cycle. Mr. Selin gave specific examples of NRC actions supporting regulatory openness and fairness regarding low- and high-level waste management, decommissioning, decontamination, and fuel cycle licensing. He also summarized the NRC regional-workshop plan to develop specific criteria for acceptable residual levels for decontamination of licensed facilities. Chairman Selin indicated that the NRC is addressing technical and regulatory issues related to the natural and man-made barriers required to isolate high-level waste, so as to be ready when DOE submits a high level waste license application. The NRC independent Advisory Committee on Nuclear Waste is performing a systems analysis to identify any significant issues that have not yet been addressed. The transfer of low-level waste regulation to individual states has raised questions of constitutionality; NRC has published a notice in the Federal Register soliciting views on compatibility between federal and state regulations. NRC also is re-examining the regulatory process for fuel cycle facilities following several incidents in 1991, and has developed recommendations on licensing, inspection, regulations, staffing and training. The agency is targeting a well-defined basis for material licensing that contains the features of specificity, commonality, and consistency.

International Organizations and Nuclear Energy

David A. Kay, Secretary-General of The Uranium Institute, emphasized the importance to the commercial nuclear industry of participation in international organizations. He focused on economics, environment, and safeguards, giving current and colorful illustrations in each area. In economics, he related that important frameworks and decisions are currently being made in which the coal and gas industries are represented, but the nuclear industry is seldom, if ever, seen. He believes that the international roles financial institutions play can best be characterized as nuclear-ignorant rather than anti-nuclear. Environmentally, the potential impact from the greenhouse effect has given rise to discussions of limiting CO_2 levels by the year 2000, imposing a carbon tax, and balancing sources of energy production. These issues are of great importance to the future of the nuclear industry, which to-date, has participated weakly at the international level, in contrast to other energy industries. The International Atomic Energy Agency's (IAEA) program on nuclear safeguards focuses exclusively on declared material and facilities; the near-success of Iraq's clandestine enrichment program demonstrated that the IAEA safeguards program was insufficient. Mr. Kay added that the break-up of the former Soviet Union increases the potential for nuclear material and associated hardware to cross borders illegally. He recommended the destruction of Iraq's nuclear program, increased UN involvement in safeguards programs, attention to the large inventory of CIS nuclear material, improved detection of clandestine programs, and tighter nuclear export controls.

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Commerce in a Changing World

Oren L. Benton, Chairman of CONCORD, NUEXCO, and Energy Fuels, commented on free trade and the anti-dumping petition filed against the former Soviet Union. An edited version of his speech is presented on page 23.

Planning Ahead in a Changing Environment

Maurice Axelrad, senior member of the law firm of Newman and Holtzinger, urged the fuel cycle participants to become involved in the evolution of new methods and regulations being developed for the industry. He noted that new regulations will have a significant cost impact, thus, the participants, being the most knowledgeable people in the country regarding their activities, should have an interest in making any new regulations fair and effective. He pointed out that there is no clear standard of performance for fuel cycle licensees, and cautioned against the application of existing nuclear power plant regulations to fuel cycle facilities. Mr. Axelrad noted that NRC has requested comments on the report of its task force, which recommended improvements in NRC regulatory programs for fuel cycle programs. He stated that the industry needs to react to the NRC recommendation and to introduce its own recommendations for consideration.

Costs of Decommissioning Nuclear Facilities

James K. Joosten, Principal Administrator for Nuclear Development of the OECD/Nuclear Energy Agency, presented a paper reviewing an international study on nuclear power plant decommissioning costs, which the agency published in September 1991. The object of the study was to discover reasons for widely varying published estimates of decommissioning costs. A positive, non-linear correlation was found between radioactive waste amounts and decommissioning costs, whereas no correlation was found between power capacity and decommissioning costs. One important conclusion of the study was that wide differences should be expected due to items such as major physical variations in plants, non-standardized national legislation and regulations, unique decommissioning policies, and different waste disposal criteria.

Status of the Monitored Retreivable Storage Program

Victor W. Trebules, director of the storage division of the US Department of Energy's (DOE) Office of Civilian Radioactive Waste Management, reported that six grants have been awarded for feasibility studies for the Monitored Retrievable Storage (MRS) facility, one is being processed, and three more have been received recently. These grants could lead to negotiations with Nuclear Waste Negotiator, David H. Leroy, to locate a site with a voluntary host for the MRS facility. If a voluntary host is not found, the Nuclear Waste Policy Act specifies that DOE may initiate the survey and evaluation of potential sites for submittal to Congress. The contractor responsible for the design of the MRS facility has identified the functional requirements and is proceeding with the conceptual design. DOE is committed to the 1998 goal for spent nuclear fuel acceptance, and has been interacting with NRC to resolve issues in a pre-licensing timeframe.

A Citizen's View

Judi H. Kallis, Chairperson of the Independent Citizens Investigation Committee (ICIC) of Grant County, North Dakota, presented a graphic description of how Grant County voted against hosting an MRS facility based on fear and misrepresentation. Grant County was awarded an MRS Phase I feasibility grant. Ms. Kallis first heard of the topic at a town meeting in July 1991, where the project was presented as if it were already finalized. This method of presentation, without solicitation of citizen input, generated distrust. Although the county commissioners were asked not to, in November 1991 they filed for and were awarded a grant. Ms. Kallis volunteered to lead the ICIC to look at both sides of the issue objectively. Starting in January 1992, the group discovered that the feasibility study was voluntary and found what liability accompanied the $100,000 grant. The ICIC visited eastern utilities' above-ground storage facilities and began to understand industry vocabulary. However, despite ICIC's efforts to gather facts on both sides and to focus on the issue, the Grant County commissioners were recalled in a March 1992 vote and replaced with anti-nuclear commissioners.

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Ms. Kallis offered suggestions to potential hosts on a better approach. She believes the presentation of the topic should be made by an impartial individual, who should discuss the process, not the project, and describe the take-it-or-leave-it nature of the study. Her group, ICIC, found that discussions of project details too early in the Grant County debate led to citizen suspicion of motives and consequent rejection of the MRS, on an emotional rather than an intellectual basis.

Utility Persepctive of DOE's Waste Program

Robert W. Rasmussen, Senior Engineer in the Nuclear Generating Department of Duke Power Company, briefly reviewed the history of the US high-level waste program established by the Nuclear Waste Policy Act of 1982. He related that utilities are concerned about Nevada's continuing ability to postpone the characterization of the Yucca Mountain site, numerous unresolved problems in cask design, siting the MRS facility, and low funding levels for DOE's current work. However, utilities are encouraged by progress in these areas, such as Nevada's recent issuance of some permits, groups applying for grants to study the feasibility of hosting an MRS facility, and independent assessments of the storage cask program. Mr. Rasmussen stated that half of the $6 billion Nuclear Waste Fund created to develop a permanent waste depository already has been spent, and in order to maintain its credibility on the high-level waste issue, DOE must demonstrate tangible progress.

Issues Related to a Potential High-Level Waste Repository at Yucca Mountain, Nevada

Jean L. Younker, systems manager at TRW Environmental Safety Systems, Inc., outlined the current status of the site characterization of Yucca Mountain as a potential spent fuel and high-level waste repository. The results of a 1991 site suitability study, requested by DOE, that identified the site as a good location for a repository are undergoing public review and comment. Three major permits have been issued by Nevada—air quality, underground injection control, and water appropriations—but many more are needed. NRC accepted a quality assurance program from TRW in January 1991, and a comprehensive environmental monitoring program has been developed to measure the effects of site characterization activities. Surface and underground investigations are planned, and preparatory activities for volcanic, seismic, and water transport investigations are underway, including construction of pads, drill holes, and trenches. DOE is pursuing pre-license issues in cooperation with NRC, and also is conducting public information activities in Nevada.

Options for Commercial Use of Highly Enriched Uranium

Loring E. Mills, Vice President for Nuclear Activities of the Edison Electric Institute, presented a summary of considerations encountered in planning for the immobilization of weapons-grade fissile material to prevent its use as a destructive force. The fissile materials of interest are ^{235}U and Pu^{239}, which have security, energy, economic, and weapons value. Converting weapons-grade ^{235}U by dilution to commercial-grade nuclear fuel for use in nuclear power plants, and handling the material that cannot be used commercially, can be done with little additional research. However, the release of the resulting low-enriched uranium to the commercial sector would impact the market and would need to be done under controlled conditions to manage and account for all the material. The speaker suggested that any revenue from the sale of the material should be allocated to stabilization of mill tailings, as well as decontamination and decommissioning of HEU enrichment facilities.

Mr. Mills stated that the best permanent disposal method for plutonium, is in a deep geological repository, and mixed with high-level waste or in a glass matrix to make it terrorist-proof. Permanent storage is the only alternative because the infrastructure to utilize plutonium commercially does not exist in the USA, and exists only to a limited extent elsewhere.

The Fuel Cycle in the New International Order

John R. Longenecker, President of Longenecker & Associates, moderated a panel discussion that addressed five topics.

Uranium Contracting—The panelists agreed that the bulk of uranium deliveries to utilities should continue to be made under long-term contracts. Short-term contracts are not expected to ever represent the majority of the market, although they are favored under the current conditions

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of high inventories, plentiful supply, and low prices. Producers stated that long-term contracts are vital to attracting financing and securing producers' high level of capital investment. Processors also prefer long-term contracts for efficient plant scheduling but have operated with both types of contracts recently. A utility representative expressed the need for low, spot-market prices to achieve costs required by its public utilities commission and to maintain supply diversity. In summary, it was noted that while participants in the nuclear industry have different contracting needs regarding security of supply and price levels, adaptability may be the best attribute for survival and profitability.

Joint Ventures and Mergers—For reasons of efficiency, profitability, and simple survival, the panelists felt that the recent pattern of joint ventures and mergers in the nuclear fuel market is likely to continue during the next five years. Producers must face the challenge of oversupply and of new sources of uranium, such as weapons recycling and uranium from eastern Europe. Fuel fabricators are globalizing for strength. By cooperating with some US utilities in an enrichment joint venture started over 20 years ago, one European enricher pointed out that the shared-risk position benefitted all parties. One panelist cautioned that an industry with too few players can become monopolistic. The panel submitted that a healthy industry results from competition: as profits increase, the number of competitors becomes greater. However, when supplies are high and profits are low, joint ventures and mergers increase.

Regulations of Fuel Cycle Facilities—In commenting on changes in the regulatory scheme for US nuclear fuel cycle facilities, panelists favored early participation by those affected, in order to develop pertinent, effective regulations that do not overburden the industry or the consumer. The resulting benefits of increased safety and environmental protection were discussed as a positive influence on public perception of nuclear power. The panel agreed that the impact of such regulatory changes in the USA would be minimal outside the country.

Highly Enriched Uranium—The panelists and audience projected that high-enriched uranium from US and Soviet weapons, diluted for use in nuclear power plants, would not be physically available for at least ten years. In preparation for its use, many government decisions must be made and facilities constructed, both of which will take time. Another topic discussed was the uncertainty regarding the specific quantity and availability of the material. The panelists pointed out, however, that in spite of the uncertainty about exact quantity, market perceptions are changing now in anticipation of the potentially enormous supply. The fate of weapons-grade plutonium was discussed briefly as well. The USA would treat it as waste; Europe and Japan could use some of the plutonium in mixed-oxide fuel and fast breeder reactors, but not enough facilities exist to process or utilize all of the material that could be available.

Permanent Disposal of Nuclear Waste—The panelists and audience agreed that the existence of suitable disposal facilities for spent fuel and high-level waste is essential for the long-term viability of nuclear power worldwide. As an example of the frustration utilities face in trying to solve their waste problems, an instance was related about one US utility that expects to run out of full core storage capability by 1994. The state in which it is located is blocking on-site dry storage beyond 1998, when an MRS facility is scheduled to be available; however, if the MRS is delayed, the utility will be faced with a tremendous problem. To further complicate matters, DOE recently described its obligation to accept spent fuel differently than in the past, tying it to the availability of a storage facility. This interjects additional uncertainty into the spent fuel planning of all utilities.

The panel agreed that the worldwide solution to spent fuel and high-level waste disposal is deep geologic disposal. The technology for this disposal method currently exists, but insufficient progress is being made on the siting of such disposal facilities. One panelist suggested that developing a disposal facility in each country, regardless of the size of the nation or its nuclear power program, is a waste of money and natural resources. He implied that resources should be shared and repositories sited only at areas that are geologically appropriate. Nevertheless, the panel and audience acknowledged that permanent, high-level waste and spent fuel disposal facilities are vital to the resurgence of nuclear power worldwide.

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WASHINGTON FOCUS

by Linda L. Gunter

Congressional committees have shifted into high gear in order to complete the legislative session prior to the political conventions held this summer. Most of the action was in the House, as committees considered FY 1993 funding proposals and began markup of HR 776, called the "Comprehensive National Energy Policy Act". House committees are expected to complete their work on the appropriations bills during April, after which the focus will shift to the Senate. The Ways & Means committee, as well as Energy & Commerce; Science, Space & Technology; and Interior committees have been given jurisdiction to work on the national energy bill. On April 8, the House Interior committee marked up its version of an energy bill. On April 28, the Ways & Means committee has a meeting scheduled to look at the tax implications of parts of the bill, including the decontamination and decommissioning (D&D) funding mechanism for the enrichment corporation. A full House vote on the bill is expected by mid-May.

House Passes Committee Budget Resolution

◇ On March 5, the House passed its budget resolution that sets guidelines for the appropriating committees. Although there was considerable debate about breaking down the walls between the defense and civilian sides of the budget to allow increased domestic spending, the House has not reached a consensus on a formula to do so. Of interest to the nuclear fuel industry, the resolution does not authorize the Department of Energy (DOE) to collect a millage fee from nuclear utilities in order to begin to recover the D&D costs of DOE's enrichment plants. In addition, the Chairman of the Energy & Water Appropriations subcommittee, Rep. Tom Bevill (D-AL), said at a hearing March 25 that he oppose such a fee. The utility witness testifying before the committee stated that the industry is prepared to pay its "fair share" but that it considers the proposed millage fee "unfair and unjust".

Energy & Commerce Committee Marks Up National Energy Bill

◇ On March 11, the Energy & Commerce committee completed its markup of HR 776, approving it by a vote of 42-1. Potentially controversial sections, such as those dealing with the Arctic National Wildlife Refuge (ANWR), Corporate Average Fuel Economy (CAFE) standards, and nuclear licensing reform, were deferred for later consideration. The uranium enrichment restructuring section of the bill provoked some controversy. Rep. Philip Sharp (D-IN) offered an amendment to ensure funding of the D&D mechanism outlined in the bill. He proposed that if the government corporation does not generate $500 million in "profits" to fund D&D, the shortfall would be satisfied by direct retroactive assessments on US nuclear utilities, based upon the amount of enrichment each utility purchased per year. The direct assessment is Rep. Sharp's attempt to compromise with utilities who had resisted his initial proposal to collect for D&D through a millage fee. The amendment also directs the President to negotiate with foreign utilities to collect money for their share of D&D. No mention is made of a government (military) responsibility for some portion of D&D, even though Martin Marietta has issued a report stating 90 percent of the contamination occurred during the period of time the plants were operated solely for military purposes.

Another amendment to HR 776 was offered by Rep. Bill Richardson (D-NM) and adopted. His amendment would require utilities to report to DOE's Energy Information Administration the origin of all uranium purchased or used by them.

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Science, Space & Technology Committee Also Marks Up Bill

◇ Rep. Marilyn Lloyd's Energy R&D subcommittee of the Science, Space & Technology committee marked up its version of HR776 on March 19. Rep. Lloyd has dropped her previous bill restructuring DOE's uranium enrichment corporation, in favor of a bill employing language similar to that of the Energy & Commerce committee's version of HR776. The most important difference between Lloyd's committee version and that of the Energy & Commerce committee is in the section for the D&D funding mechanism. The Energy R&D bill would require only $300 million per year be contributed to the fund, as opposed to the $500 million suggested in the Energy & Commerce bill. The money would be collected from leasing payments for the gaseous diffusion plants and licensing fees for AVLIS (atomic vapor laser isotope separation), repayment of the initial government loan of $364 million, plus 2.5 percent of the revenue of the corporation. However, the utility portion would be capped at $2.5 billion or 15 years, whichever comes first. If all of these sources fall short of the $300 million per year payment, a backup fee would be assessed on US nuclear utilities, as Rep. Sharp proposed.

Reps. Sid Morrison (R-WA) and Robert Walker (R-PA) offered a Republican substitute for the entire Energy R&D energy bill, but it failed to gain committee approval. Rep. Walker opposes the R&D bill because it does not fairly allocate the burden of D&D between the utilities and the government. Like the Senate bill, the Morrison/Walker version would authorize a 50-50 cost sharing for cleanup of the diffusion plant sites. Although failing to gain committee approval, this amendment, as well as others, may return for consideration by the full House prior to its vote.

On March 31 and April 1, the Science, Space & Technology committee (SS&T) marked up what could be its section of the House Comprehensive National Energy Policy Act. There were no amendments offered to alter the enrichment section. The Committee's version of the bill seeks to authorize many of the Energy R&D programs within its jurisdiction as well as to create new programs. Since Chairman George Brown (D-CA) is frustrated with the SS&T committee's inability to pass an authorizing bill, he decided to include funding levels in his committee's version of the bill. The SS&T version was approved by voice vote.

Interior Committee Markup

◇ The Interior committee markup of HR776 was much more contentious than that of the two other committees. (The Interior committee has sole jursidiction over nuclear licensing and some mining issues, as well as joint jurisdiction over the uranium enrichment and spent fuel programs.) Since Interior was using the language of Energy & Commerce committee's version of the energy bill, Rep. Pete Kostmayer (D-PA) offered a substitute amendment for the original Sharp uranium enrichment proposal. Kostmayer's amendment would have capped the utilities' liability for a D&D fund at $2.5 billion. Under the original amendment passed by Energy & Commerce there is no total liability. Kostmayer's amendment was rejected, but during the debate on the issue Rep. Sharp declared if Rep. Kostmayer's proposal to limit utility liability were ever to be successful, he would move to strike the enrichment title from the bill.

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In additional discussion of the enrichment section of the bill, the Interior committee approved an amendment offered by Chairman George Miller (D-CA) and Rep. Phil Sharp, which would alter the method for corporation privatization, as well as creation of the D&D fund. In the Energy & Commerce version, the corporation would become private when $364 million of stock was sold. Under the Miller/Sharp amendment, instead of a stock sale, the assets of the corporation would be sold through a competitive bidding process, after the Office of Management & Budget had made a secret minimum bid determination. Details of which assets would be sold and the mechanism for their sale were not described. Foreign governments would be precluded from bidding on the assets.

Of interest to fuel cycle companies, there were several other amendments made by the Interior committee. Reps. Wayne Owens (D-UT), Craig Thomas (D-WY), and Bill Richardson (D-NM) offered an amendment, replacing a previously deleted section, that includes the mill tailings cleanup funding provisions from the Energy & Commerce bill. Rep. Owens offered another amendment giving states the authority to limit the import of nuclear material or slightly radioactive material for burial in their states. Both of these amendments passed. The latter amendment could be damaging to uranium mining companies with tailings piles undergoing reclamation or uranium companies that have decided to convert their tailings piles to a low-level waste facility site and accept additional slightly radioactive material for a fee. Finally, an amendment was adopted that would force NRC to report to Congress about previous exports of HEU and make it more difficult to get a license to export HEU for use in research reactors. Rep. Barbara Vuccanovich (D-NV) was successful in having the existing section dealing with the Yucca Mountain repository stripped from the Interior version of the bill. Her justification for the removal is that the Yucca Mountain section, that would prevent the state of Nevada from interfering with DOE's efforts to characterize the repository, violates the state's rights. The Committee approved its version of the energy bill by voice vote.

Congress Considers Hazardous Waste Act

◇ Congress has begun consideration of a reauthorization bill (HR 3865) for the Resource Conservation and Recovery Act (RCRA), the solid waste law that governs the disposal of the country's hazardous waste. The Transportation and Hazardous Materials subcommittee of Energy & Commerce committee marked up its version on March 26. A section of the bill seeks to extend EPA's regulatory authority on mine wastes. Initially mine wastes were exempt from RCRA regulation Section C as hazardous waste. In the proposed bill, EPA would regulate these wastes under a two-tiered scheme, with Section C regulating hazardous waste and a new Section D regulating non-hazardous solid mine wastes which will apply to:

- ores, and other materials on leach pads
- leach process solutions
- pond or impoundment leach solutions
- waste in mine workings or pits
- ore and subgrade stockpiles.

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The proposal would exempt UMTRA (Uranium Mill Tailings Reclamation Act) sites from regulation, as well as mine waste from exploration activity, but this bill apparently would affect the newer, presumably more efficient sites that mine using in-situ processes. The proposal assumes that regulation would be performed by the states, although if a state refused to regulate up to the federal (EPA) standards then EPA could retain jurisdiction. The language is designed for those states that wish to implement standards more stringent than federal regulations. No schedule for full Energy & Commerce committee markup has been announced yet. The Senate Environment committee will markup the bill April 29.

DOE Issues Request for Interest in Fernald and Hanford Material

◇ In the March 24 issue of *Commerce Business Daily*, DOE issued a request for expressions of interest in the usable nuclear material at Fernald and Hanford. The announcement indicates DOE prefers to sell all the material in one lot of about 600 MTU of natural uranium and approximately 4,000 MTU of low enriched material (0.82-1.25 ${}^{w}/_{o}$ ^{235}U). However the notice says each response should "explain how to minimize the impact on the domestic uranium industry".

All the material will have to be processed before it can be used in the commercial fuel cycle, making it likely that a converter capable of handling the material will need to be part of the winning bid. All of the low-enriched material resulted from reprocessing and thus is slightly contaminated with ^{236}U. The uranium is in various chemical as well as physical forms. Consequently, DOE prefers to exchange the uranium for commercial natural uranium which meets ASTM specifications, although the notice says DOE will consider a sale of the material. In either case, DOE is unwilling to incur any expenses such as sampling, analysis, packaging, shipping or processing; these expenses must be borne by the recipient. Expressions of interest are to be sent to DOE's contractor at Fernald by May 22.

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INDUSTRY BRIEFS

SILVA Program Takes Important Step

France's Commissariat á l'Energie Atomique (CEA) announced that it had made an important step forward in its laser uranium enrichment program, when its SILVA enrichment process produced ten grams of enriched uranium suitable for use in PWRs. Over the next few years, CEA will continue to test its process (similar to USDOE's AVLIS). CEA plans to use the laser process in its next generation of uranium enrichment plants, but is not aggressively pushing for commercialization of the technology, given the current overcapacity situation in the world enrichment market, and the good performance of the gaseous diffusion enrichment plants of Eurodif.

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DOE Announces FY93 USC Price

The US Department of Energy has announced the FY1993 base price for its Utility Services Contract for enrichment services. The new price of $125.00 per SWU will become effective on October 1, 1992.

NSP Announces Reactor Relicensing Plans

On March 27, Northern States Power Company announced that it plans to submit a license renewal application to the NRC in 1993. The application will make NSP's Monticello reactor the first nuclear plant in the USA to go through the license renewal process. Yankee Atomic Group's Rowe, Massachusetts, plant was to be the first, but it was shutdown permanently in February for economic reasons. Monticello, a 536-MWe BWR, first reached commercial operation in 1971.

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Incident at Reactor Near St. Petersburg

A fuel channel failure at Sosnovy Bor 3, a 925-MWe RBMK, near St. Petersburg, Russia, led to a level 2 incident at the plant on March 24. The failure was caused by an isolation control valve that opened accidently, decreasing coolant flow to the channel and resulting in overheating. Although some radioactive gases were released, the release was not significantly above normal levels, and off-site measurements never exceeded permissible limits.

Total, Denison Agree to Uranium Development Deal

Denison Mines, Ltd. and Total Compagnie Miniere have reached a tentative agreement to develop jointly their neighboring uranium deposits in the Athabasca Basin of Saskatchewan. The agreement outlines that Denison will receive C$25 million in cash, as well as a 22-percent share in Total's Wolly project (McClean Lake) and use of the planned mill. In return, Total, the French mining firm, will acquire 70 percent of Denison's share of the Koongarra deposit in Australia, and will have the right to 70 percent of Denison's share of production from the Midwest project in Saskatchewan. The Wolly and Midwest projects are only about ten miles from one another in northern Saskatchewan. The agreements are subject to many conditions, and must be approved by both the Canadian and Australian governments.

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China Formally Accedes to NPT

In early March, the People's Republic of China formally acceded to the Treaty on the Non-Proliferation of Nuclear Weapons. China was the only nuclear-weapons state that had not yet signed the treaty.

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Duel-Use Export Control Policy Established

A group of 27 nations, known as the Nuclear Suppliers Group, agreed on April 3 to a common set of export controls for dual-use items (products that can have both peaceful and military applications). The agreement, which was in negotiation for more than a year, establishes regulations for the export of both nuclear and non-nuclear items and is a major step forward in the world's non-proliferation efforts. The signatories agreed not to export specific equipment, materials, and technologies to countries that have not accepted IAEA safeguards on all of their nuclear activities. The countries included in the Suppliers Group are: Austria, Australia, Belgium, Bulgaria, Canada, CSFR, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Luxembourg, The Netherlands, Norway, Poland, Portugal, Romania, Russia, Spain, Sweden, Switzerland, UK, and USA.

Westinghouse and Philippines Settle Lawsuit

In a March 4 announcement, Westinghouse Electric Corporation and the Philippine government stated that they had settled their long-standing lawsuit regarding the PNPP-1 nuclear power plant. The three-year-old lawsuit alleged that the 620-MWe PWR supplied by Westinghouse had construction deficiencies and that the manufacturer had paid millions of dollars in bribes to former government officials under the Ferdinand Marcos regime.

The agreement dictates that Westinghouse will complete construction of the plant, which has been mothballed since 1985, upgrade it to current standards, and bring it into commercial operation within 3 to 4 years. The Philippine government will pay Westinghouse US$40 million per year to operate and maintain the unit. Westinghouse must sell the power generated by the plant at 2.9 cents per kWh to the Philippine National Power Corporation, who will, in turn, sell it to retail customers at a profit. Estimates to complete the plant total $400 million, of which Westinghouse will provide cash and credits totalling US$100 million over three years to the Philippines. The other $300 million will be paid by the Philippines, financed by the Export/Import Bank. The allegations of bribery and construction deficiencies were never proven. The plant's architect/engineer, Burns & Roe, who was also named in the suit, will not have to pay anything under the terms of the agreement.

South Africans Support Reforms to Negotiate Non-Racial Constitution

In a dramatic vote on March 17, sixty-nine percent of voters in a whites-only election chose to support President F. W. deKlerk's reforms and to back continued negotiations for a new non-racial constitution for the country. Although there undoubtedly will be further challenges to progress in South Africa, the vote, which had an 85 percent voter turnout, clearly provides the mandate for DeKlerk to proceed aggressively with his reforms. The Convention for a Democratic South Africa (Codesa), which involves nineteen different political parties including DeKierk's ruling National Party, is making steady progress on a new constitution and on developing an interim government. The vote of support for DeKlerk, and indirectly, Codesa, indicates that South Africa will continue its progress and once again become an integral part of the world market.

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SPEECH

COMMERCE IN A CHANGING WORLD

The following article is a slightly edited version of a speech presented by Oren L. Benton, Chairman of CONCORD, NUEXCO, and Energy Fuels, at the USCEA Fuel Cycle '92 Conference in Charleston, S.C. on March 23, 1992.

My message is more of a personal message as a businessman engaged in a broad range of businesses and who travels extensively in other nations, than it is on behalf of NUEXCO, ENERGY FUELS, or any other specific CONCORD activity. At the same time, I acknowledge that my views will undoubtedly impact the policies of these organizations even with such strong leaders as Earl Hoellen, Jerry Grandey, and others in CONCORD, the name by which my group of diversified companies is known.

Doing business in today's changing world is a bit like looking into those space-game video screens with their Star Trek images. We become frozen into a position of continuously looking forward. The speed of change around us is such that we cannot look backward, lest we collide with a planet of problems ahead. We cannot look sidewise, lest we become dizzy and unable to keep our spaceship or company on course. As the pilot of a company, one cannot really see what lies ahead, only that he will be there in exactly 3 days, 4 hours, 8 minutes and 20.23 seconds. He can only hope that he lands in the galaxy of the business plan and that the objective has not changed by the time he gets there.

The people at this conference are here for a number of different reasons. Most are here in a serious effort to stay informed and to try to understand the incredible changes that are occurring in the economic, political, legal, and social environments in which we must conduct our highly sensitive nuclear fuel cycle business. We all hope to pick up information or knowledge that will permit us to improve our understanding of the present, and better anticipate the future.

We frequently hear that change is healthy, change is inevitable, and change is opportunity. Some people, however, cannot and will not stand for change and probably will not survive long in business. Some people love change just for the sake of change. Such persons love "life in the fast lane", can be dangerous, and probably are not top leaders in business.

Change is not frightening to me as a businessman, but I remind myself constantly that I really have very little ability to accurately foresee change, or the extent and timing of change. The moment that I am certain there will be change, there probably will not be, and vice versa. I try not to become vulnerable to, or disheartened by change, but to be aware of it, adjust to it, and take advantage of it. I tend to look at business and life as a play in which I am both on stage and in the audience. I hope that it permits me to have a better perspective on both business and life, and to laugh at my own ineptness or mistakes. The future frequently is less important than the enjoyment of active participation in the process of change.

I have one or two companies whose futures are uncertain because of changes to which they may not be able to adapt. I enjoy and support them no less; and I am particularly excited to observe how their managements reach, experiment, succeed and fail. It is, of course, better to succeed than to fail, but to be in business today, one must be prepared to accept both. Hopefully, the ratio of successes to failures is comfortably positive, but success is hollow unless it is based on taking a risk of failure.

The nuclear energy industry has had its risk-takers. We should celebrate those early scientists who risked their health and lives experimenting with the atom, the Boards of Directors who authorized the first nuclear power plants, and especially the uranium explorationists who searched for that elusive, mystical substance called uranium. Such risk-taking is what life is all about and is necessary to achieve the highest goals in business and in life.

Today, the nuclear energy industry is perceived by most as a high-risk industry. We, and the public, listen carefully to every word of a report if it happens to concern a nuclear power plant. Therefore, it is axiomatic that all elements in the nuclear energy industry, including the nuclear fuel cycle, are risk-oriented. In any such high-risk environment, those who manage risk well, will succeed, and those who do not, will fail.

I believe that those who try eliminate completely the risk of failing are destined to stand still. I especially believe that those who seek to eliminate market risk through legislation, regulation, and administrative actions rather than

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by innovative management are putting their efforts to the wrong tasks. Innovators and risk-takers could lead nuclear energy into a new era, but only if government controls and intervention are restricted to military applications, licensing, and safety issues. The industry's "energy from the nucleus" root, utilized positively rather than defensively, could be a rallying effort, not one of fear. In this respect, I believe the USCEA is doing an excellent job of promoting this industry to the public. This public relations effort must, however, be converted into leadership action in order to obtain the desired results.

Nuclear energy's nuclear-weapon cousin was the understandable justification for the original government ownership of most nuclear energy industry elements throughout the world. However, governments are poor risk-managers, particularly in a rapidly changing environment. Government ownership is the antithesis of capitalism. The motivation and instincts of government entities are not those of innovators and risk-takers; government decision-making is too cumbersome and tends to seek protectionism rather than competition. As a businessman, I would advocate, however impractical, privatization of the entire nuclear-energy industry, but privatization in the USA would not change the industry's predominant government ownership in the rest of the world. A truly worldwide, free-enterprise market, along with full competition, free of government support and control, would either justify this industry in a competitive, changing world or would cause the industry to fall short of its objective of being the energy of the future. The burden is, and should be, on the industry to prove that it is efficient and safe enough to be worthy of this objective.

It is exciting, but also ironic, to see the former Soviet Union's newly created countries scrambling to privatize and racing to integrate into the Western market economy. They are quickly learning, however, that the term "market economy" is not a discrete condition and that free world and free-market economy are not synonymous terms. They are seeing hypocrisy displayed in the free world, particularly by some in the nuclear energy industry. Actions in the name of free trade are not necessarily actions of free trade, but instead, can represent self-serving protectionist actions to legislate against or regulate market risk. I fully realize that there are some in this industry and audience who have different opinions and would invoke protectionism, even through trade laws designed to assure fair competition. I favor fair competition, but I believe that open and full cooperation, not protectionism, should be the proper response to the efforts of these new countries to adopt a market economy. The free market is a far better judge of what is "fair" than is a government committee or bureau.

I have visited Russia, Kazakhstan, Uzbekistan, Ukraine, Georgia, and other republics of the Commonwealth of Independent States several times. No one can do so without appreciating the enormity of the task they have undertaken to become democratic and to operate with free markets. On those visits, I can see opportunity after opportunity for the United States and other Western countries to help by cooperating in their task. How will history judge us if we fail to help? Worse yet, how will history judge us if we put barriers on that road to democracy and trade? I, for one, believe we are doing far too little; and I'm pleased to see that former President Nixon has exactly the same view.

The American anti-dumping investigation and the Euratom administrative actions to attempt to effectively embargo or severely limit imports of nuclear fuel from the former Soviet Union into the European Economic Community and the United States, in my opinion, are examples of hypocrisy. Let's be honest and realistic. The battle of anti-dumping is not primarily over US miners' jobs, but over market share by government-owned and operated enterprises in the nuclear fuel cycle. More than any concern over long-term security of supply or consumer interests, Euratom's actions are protecting large producers, and driven by them. If the former were solely the objective, the immediate movement of large inventories into Europe would give ample assurance.

The simple truth is that the world, as a whole, is temporarily awash in uranium, not as a result of free trade, but as a result of the military machines of the world and of government-directed monopolistic programs in nuclear energy. These programs encouraged massive exploration programs that were successful, but then continued beyond that justified by free-market supply/demand factors because of monopolistic contracting practices. Why should we not let free-market principles work in a free world? What are we afraid of? Where are the consumer-interest groups,

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particularly in the USA, to advocate and even demand the realization of a true peace dividend in the form of lower nuclear fuel prices to consumers and increased exports of consumer goods?

The excess nuclear fuel inventories of the world are the result of military-driven government policies of the past. Consumers now deserve the benefits of the lower fuel costs, even if temporary, and should be demanding them. The fact that US consumers, because of the large uncommitted nuclear fuel demand, stand to benefit the most from low nuclear fuel prices is an ironic but appropriate dividend on a heavy US military investment. This investment was made by US taxpayers in leading the defense of the free world which, in my opinion, significantly contributed to the collapse of communism in Eastern Europe.

The salvaging of the military inventories of the world, whether they be in the form of recycled tanks, guns, nuclear weapons, or excess uranium inventories, should be welcomed and realized, not thwarted by the misuse of the term "fair trade" and wasted. As a businessman and an advocate of peace, I also would make the decision in an instant to dismantle nuclear weapons and reprocess the material into usable nuclear fuel. CONCORD supports and is participating in the private and public discussions that are examining this option. If we do not encourage and supervise this gigantic recycling project in a way to control or guide the flow of these excess inventories into world markets through open channels with appropriate safeguards, the inventories will enter world markets through closed, dangerous channels.

It seems especially counterproductive to me to have political voices arguing isolationist themes of the confrontational past and penalizing our US and Western world consumer-goods producers that are so badly in need of increased exports. I am personally aware of the immediate willingness of the new Commonwealth of Independent States to spend from the hard currency of uranium sales, hundreds of millions, or even billions, of dollars for basic consumer goods like the meat products of Colorado and Wyoming, the grains of my own Midwestern roots of Iowa, as well as the processed goods of our industrial areas.

In my opinion, US nuclear utilities should be leading their local economic development organizations into trade with the former Soviet Union to arrange the export of products from their utility service area, in exchange for import of uranium and other resources. Imagine how much more productive this would be in the total scheme of things. Here is a chance for utilities to do something for the regions they serve, beyond the mere function of providing electrical power. I find it ironic that our own actions might demonstrate that we, in the West, encourage selective central planning, however cloaked, in terms of fair trade, long-term security of supply, or any other such phrases.

I urge that this industry step up and lead participation in the greatest peace adventure and trade expansion opportunity of this century. Our industry not only has an opportunity, but a responsibility, to show the value of cooperation, openness, and creativeness to solve the problems of the changing world. Its proper focus on cooperation in safety matters would be strengthened by an additional focus on trade development. To be seen as accepting protectionism is wrong for this industry.

Similarly, this industry should not continue its discriminatory trade practices against South Africa. Last week, over two-thirds of white voters voted to support President de Klerk's initiative to end apartheid and to have blacks share power with whites. This is a goal the United States has strongly encouraged for many years. Now the hoped-for watershed event has occurred. A whole nation of over 30 million people will have to reorganize, reconstitute, and reshape in an emotional situation. What is our response? Should we sit on our hands and see what happens—leaving in place all the roadblocks erected over the years and making South African life more difficult in peace? I hope not. The time has come for change. The discriminatory term, "non-South African", should be promptly eliminated from nuclear fuel bid specifications as should "non-Soviet," and "non-Chinese."

The People's Republic of China is a more difficult situation. Here the change is much slower. The government is attempting more economic freedom while attempting to maintain the old political system. Whether this plan succeeds remains to be seen. As trade builds, so will the demands for more freedom. The television set and the fax machine are the greatest political tools ever developed. We should not encourage the People's Republic of China to pull back into its shell by putting roadblocks in the way of trade.

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So far, I have talked mainly about the advantages to the world of free trade. What about the impact of protectionism on the US consumer? The undeniable fact is that protectionism in trade is unbelievably costly to consumers. It was recently reported in *Newsweek* that a Federal Trade Commission study estimated tariffs cost the American economy $81 for every $1 of adjustment costs saved. Restrictions on clothing and textile imports cost consumers $1 for each 1 cent of increased earnings of American textile and clothing workers, according to the London-based Trade Policy Research Center. According to the Institute for International Economics, trade barriers are costing American consumers $80 billion a year, equal to more than $1,200 per family. This is poor "Commerce in a Changing World."

I do not believe that a dumping duty on imports of uranium and nuclear fuel services into the USA from the new countries of the former Soviet Union will solve short- or long-term problems of the US production industry. The fact that we have had over 1,000 dumping cases filed since 1980 (one every four days) simply shows that we have legislated poorly and have created a whole new body of law and a battery of high-priced, trade-specialist lawyers. The legislation also has created a new government bureaucracy with almost criminal-like investigative powers, not subject to normal due-process conditions and court-appeal procedures. This restrictive process, to date, has not been a good example of democratic principles or rule of law to a group of countries that we have worked so hard and paid such a high price to convince to adopt our social systems. The courts will need to address important questions of jurisdiction and procedure before the investigation is concluded.

I also do not believe that protectionist, regulatory, and administrative actions in the European Economic Community will serve consumer interests in either the short or long term. The actions do not have the support of all member countries and should not be allowed to be driven by large monopolistic interests. Quotas are not the solution but, instead, are the acts of socialist non-market economies. It is incredible to me that at the very time certain Western interests cry foul as to the previous non-market economies of the former Soviet Union, they, themselves, are so quick to invoke non-market economy principles, such as quotas. If it is fair trade we want, we should let the market work. I suggest that the sooner we get the excess nuclear fuel inventories of the world efficiently relocated, the sooner the industry can get back to a producer-oriented pricing system based on market principles.

Some worldwide agreements at national levels may be the only way to provide the tremendous investment of capital needed in the former Soviet Union. And if nuclear fuel becomes a part of such overall solutions, then the greater good is achieved. I do not object to innovative solutions by governments in the interest of world peace and trade development. I just do not believe it possible, and therefore think we should let free market and competitive principles solve the problem.

I am not frightened by the changes in this industry, but am adapting to them. As evidence of this, CONCORD's joint venture, ENERGY FUELS, is becoming engaged in the uranium mining industry in several new Eastern countries that were formerly part of the Soviet Union. These activities will be those of a full mining partner, supplying capital, technical expertise, and marketing assistance. Production plans and costs will be based on market-economy principles, and we fully intend to price our uranium product on a competitive basis. We prefer to show how market-economy principles should be followed.

ENERGY FUELS, the largest US uranium producer for a number of years, probably has the best ore grade of any uranium mine in the United States. We wish it was in production, but it is not. We, therefore, adapt to changing conditions. The foreign competition in ore grades is too strong and has been for several years. Perhaps that will change in time. We retain our ability to produce on a stand-by basis and continue an active, albeit reduced, exploration program. We are expanding our reserve position through acquisition and adopting alternative business plans. I think it would be very risky and foolish, however, to push ahead with production if it depended upon some government action to force up prices. A government that has the power to raise prices substantially, has the power to drop prices substantially. Without the underpinning provided by prices set by a free market, it would be excessively risky to proceed aggressively into production.

To look at the risk of restarting production based solely on a dumping action that assessed duties and increased prices, consider, for example, the subsequent price decrease that would result from a legislative solution which I could support, such as the following. Congress could, through

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an amendment to some existing bill, exempt, for a limited time of three to five years, US imports of uranium from the Commonwealth of Independent States from the anti-dumping laws. This would quickly eliminate the artificially created price increase. Such legislation would require that, say, 75 percent of the sales proceeds must be spent on the purchase of US consumer or industrial goods or services. Concurrently, employers of uranium workers would be granted a refundable or transferable tax credit equal to the wages paid to workers whose jobs have been reclassified during the period beginning two years ago and continuing through the three- to five-year exemption period. The credit would be a minuscule cost to taxpayers and would directly address the problem of jobs, while permitting price benefits determined on a free-market basis to flow through to consumers. The reassignment of mining workers to the reclamation efforts so needed in this industry would represent a positive development, subsidized by the tax credits.

This solution may never be achievable, but it would be interesting to see if the non-US owners of US production companies might then cry foul as they see thwarted their effort to stick US utilities with higher-priced nuclear fuel produced not in the USA, but in Canada and elsewhere.

CONCORD's focus is not only on uranium. CONCORD's food processing equipment and systems company is engaged in the installation of critically needed systems in the former Soviet Union to effectively process meat, vegetables, and other foodstuffs to avoid the current 40 to 50 percent waste due to their inability to preserve the foodstuffs. If we have to, we will accept uranium in payment for such exports even if we have to sit on it until this industry returns to a market economy. How can we consider the alternative of continuing such wastage at such a critical time in the Commonwealth of Independent States? This is "Commerce in a Changing World."

Another CONCORD Business Unit is developing low-cost housing in certain areas of the former Soviet Union. We will accept uranium in trade. We may have to be innovative to reach the market of the world, but I do not believe that a world embargo will, or should, be successful. The uranium will not go back into the ground. Another Business Unit is in a joint venture on drill-hole logging technology being utilized and further developed by the oil industry in the republic of Russia. Another Business Unit is negotiating the establishment of a banking institution in the former Soviet Union. This is "Commerce in a Changing World."

We should note that the former Soviet Union is not the only place where large changes in trade routes and patterns are occurring. Certain of CONCORD's non-uranium trading activities have sourced from and invested in China-based production and have been evaluating trade activities across the Far East, China, Mongolia, and Siberia. The old silk route, from Siberia, as well as from the Central Asian countries, to Japan, Korea and other Asian countries, may indeed be open again. It is important that trade with China, as it adopts more elements of capitalism, and South Africa, as it completes its major reorganization, be through equally open trade channels. This is "Commerce in a Changing World."

A somewhat unique, but especially enjoyable, CONCORD activity is that our CONCORD employees, and separately the children of our CONCORD employees, have made a number of trips to the home countries of our new global-trading partners, as well as hosted many groups of foreign employees and children. This is also "Commerce in a Changing World." I believe that cross-border commercial ventures are best based not only on legal documents but on personal relationships. Peace in the years ahead will depend more on the personal relationships established and cross-border educational experiences achieved in today's commercial ventures than on treaties and alliances. Quotas and other monopolistic-oriented actions, whether in the form of protectionism, cooperation, or soft cartels, do not create personal relationships.

CONCORD is, in world-institutional terms, a small company; we do not pretend to be a major factor in world trade or relations. I, and all CONCORD employees, do however, get very personally involved and do enjoy seeing the thrill of young faces feeling new hope and having good times in new worlds, every bit as much as seeing older leaders experience new commercial awakenings of a truly free world. I sincerely hope that free trade and fair trade continue to be principles of our capitalistic free world. I pledge my company's participation in and support of free trade to the maximum of our capability. I do not seek to make CONCORD, NUEXCO, or ENERGY FUELS controversial in this already controversial industry. We want merely to participate, not through lawyers or regulatory actions, but directly through trade development in this changing, increasing market economy of the world.

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I have on various occasions commented on the NUEXCO Exchange Value, my confidence in its validity, and our responsibility for such a market measurement in this industry. We continually are alert for any industry perceptions of conflict of interest. To that end, I invite industry participants to give NUEXCO input to a study and evaluation of the potential effect of a possible decision to discontinue, spin off separately, or otherwise change the publishing of the NUEXCO Exchange Value. I note that if producers and governments both seem to be urging higher nuclear fuel costs, and if utilities are simply going to stand by and see higher nuclear fuel costs be "cooperated" or legislated into existence, I question the wisdom of trying to accurately measure an "administered" market. NUEXCO would trade no less and would even perhaps expand its trading role. I have said before that NUEXCO has an industry responsibility in market reporting simply because of tradition and validation in the market and that it would not precipitously discontinue such reporting. The current US trade and European administrative actions that openly restrict a free market give me ample concern, however, as to the wisdom of continuing such reporting of the Market Values. *Caveat Emptor* may be the only market-economy principle that survives; but God help both the consumers and producers when government-orchestrated directives are used to "protect" either the consumers or producers.

In the interest of examining new alternatives, the CONCORD/NUEXCO organization also has been working for several years on the establishment of an international inventory of uranium materials of various origins and forms and, possibly including some of the very substantial inventories of the former Soviet Union. Such an inventory of material would not be for sale in the spot market but would be made available to provide security to long-term delivery contracts and for various financing arrangements. A company, First International Reserve of Materials (FIRM) AG, has been formed in Switzerland for such purpose, and a series of discussions has been held with certain needed supply, financial, and management elements. The fact that inventories already mined and processed have zero-incremental cost levels should somehow be used to benefit, not threaten the industry. I would comment that, from my personal experiences, the owners of these inventories of the former Soviet Union have shown responsibility in the world market and have increased exports, primarily in the interest of jobs. I expect and encourage such responsibility to continue, but realistically, the world's uranium producers and processors, however motivated, cannot expect a group of independent producing countries which have 30-40 percent of the world production capacity to continue to accept a market share of less than 10 percent.

I have described to you today my beliefs in the fairness and morality of free trade and its importance to those nations we are attempting to help at this crucial juncture in world history. We must also remember that in order to sell to the various nations, including the republics of the former USSR, South Africa, and China, we can do so only if we buy from them. Given their situations, some of these nations have, at this time, only a few things to sell: nuclear fuel is one.

I also have described to you certain developments in our CONCORD business activities which are not only risk-taking, profit-motivated ventures, but are designed to enhance security of supply, as well as to facilitate the movement of nuclear fuel in the most optimum manner. At the same time, we think this will aid those nations that so desperately need trade. Our Western economies, including the USA, may not be strong enough presently to provide the full level of aid needed, but can certainly support trade.

My interest as a businessman has not been wholly as one interested in economics, trade, and profit. I see those, in part, as a means to an end. What I see is the opportunity to use business as a means of furthering attitudes and goals that will shape events far into the next century. The opportunity simply must not be lost.

I express my appreciation to the USCEA for inviting me to speak and providing the open forum. I hope that my honesty in expressing my views has not offended you, but challenged you. NUEXCO and ENERGY FUELS have been, and will be, participants in the nuclear fuel cycle for a long time, and CONCORD plans to continue adapting its actions to "Commerce in a Changing World".

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SPAIN

Historically, Spain's nuclear program has had its share of successes and challenges. The country currently operates nine nuclear reactors totalling over 7,100 MWe of capacity and accounting for more than a third of Spain's electricity generation. Yet four reactors at advanced stages of construction remain mothballed due to a government-imposed moratorium, and a fire at one reactor in 1989 led to its premature closure and to a revival of anti-nuclear sentiment in the country.

In the new national energy plan, Spain opted to continue the moratorium and rely upon conservation measures, additional natural gas imports, and electricity imports to meet expected demand. The current nuclear facilities will continue to operate, and the government will continue to pursue advanced reactor research, and expansion of the country's domestic uranium industry. Spain's integration into the European Community also is affecting the country's energy plans, prompting consolidation within the Spanish electricity sector in order to be more competitive in Europe.

NATIONAL ENERGY PLAN

From the 1950s to the early 1970s, Spain experienced an industrial boom resulting in an economic growth rate of over five percent per year. With this growth came a dependence on imports for more than 70 percent of the nation's energy. As one of the industrial world's most energy import-dependent economies, Spain was hit hard by the oil-price shocks of 1973 and 1979. As a result of the oil crisis in 1973, the government decided to develop a national energy plan, its purpose being the prudent management of Spain's natural resources and the promotion of an independent energy program. The preparation of the national energy plan and its revision were assigned to the Ministry of Industry and Energy.

Spain's first National Energy Plan (Plan Energético Nacional—PEN) was prepared in 1975 under the government of General Francisco Franco. According to this plan, 70 percent of the nation's annual electricity needs was to be generated by coal and nuclear by 1990, compared to less than 20 percent in 1973. Based on an annual growth rate of over 5 percent for electricity, the PEN proposed the construction of 12 nuclear plants having a combined net capacity of 11,550 MWe. After Franco's death in 1975, a new government, led by King Juan Carlos and his Prime Minister, Adolfo Suarez, held free elections and drafted a new constitution establishing Spain as a parliamentary monarchy. However, at that time, Spain began nine years of double-digit inflation, and real economic growth slowed dramatically to an annual average of 1.6 percent. By 1982, these economic woes led voters to defeat Suarez's moderate, right-center political coalition and vote into power the Spanish Socialist Worker's Party (PSOE), led by Felipe Gonzalez Marquez. In 1984, the new government announced a revised official PEN that reflected the PSOE's anti-nuclear platform. This plan reduced the previous capacity projections and called for the indefinite deferral of five nuclear units that were under construction and two units that were planned. Among the units under construction that were deferred indefinitely were the twin Lemoniz PWRs and the Valdecaballeros units.

The PSOE was re-elected in 1986 and again in 1989; however, it lost ground to both right-wing and left-wing opposition parties. With energy demand growing more rapidly than expected and with Spain moving toward increased integration with the rest of Europe, many expected that the government's new national energy plan of 1991 would lift the nuclear moratorium on those units already under construction. But that was not the case.

Spain's new PEN, published by the Gonzalez government in 1991, does not permit the operation of any new nuclear plants before the year 2000, and instead, will depend upon natural gas to meet the country's growing electricity demand. To provide fuel to the new gas-fired plants, Spain recently signed a natural gas agreement with Algeria and Morocco for the construction of a 1,265 km pipeline from Algeria's Saharan reserves, through Morocco, and under the Straits of Gibraltar to Seville.

The official PEN was sent to the Spanish Parliament (Cortes) on July 25, 1991. Under the new plan, nuclear power's share of Spain's total installed electrical generating capacity will fall from about 17 percent in 1990, to approximately 14 percent by the end of the century (**Table 1**). The reduction in the total contribution of the nuclear sector will result from a stabilization of nuclear generation at the present level, as no new nuclear plants are

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Table 1
FORECAST ELECTRICAL GENERATING CAPACITY BY SECTOR ACCORDING TO NEW NATIONAL ENERGY PLAN

	Installed Capacity					
	1990		1995		2000	
Source	MW	%	MW	%	MW	%
Hydroelectric	16,103	37.0	16,420	35.5	17,005	33.1
Nuclear	7,363	16.9	7,363	15.9	7,363	14.3
Domestic Coal	9,362	21.5	9,362	20.3	10,559	20.5
Imported Coal	1,314	3.0	1,314	2.8	1,864	3.6
Oil	6,574	15.1	6,298	13.6	3,105	6.0
Gas	1,320	3.1	1,320	2.9	6,648	12.9
EdF Imports	0	0.0	1,000	2.2	1,000	2.0
Cogeneration	1,454	3.4	3,150	6.8	3,906	7.6
Total	**43,490**	**100.0**	**46,227**	**100.0**	**51,450**	**100.0**

expected to be integrated into the national electric system during this period. The contribution made by natural gas will more than quadruple to almost 13 percent. Industrial cogeneration is expected to make up about 3,900 MW of new electric generating capacity, representing almost eight percent of installed capacity by the year 2000. With demand now forecast to increase at 3.5 percent per year, the anticipated additional capacity requirements of 9,000 MW will be covered by electrical production from natural gas (11.3 percent), hydroelectric power (16.4 percent), domestic and imported coal (34.7 percent), and electricity imports from France (4.4 percent) (**Table 2**). Electricité de France and Redesa, Spain's national electricity grid corporation, signed a ten-year contract allowing Spain annual imports of electricity generated by 1,000 MWe of capacity, starting as early as 1993. The imports depend upon the completion of a transmission line over the Pyrenees Mountains from France to Spain.

According to the new PEN, nuclear energy policy will adhere to the following directives:

- Given the large contribution of the nuclear complex to total energy production in Spain, one of the primary objectives is to maintain the country's nuclear plants in excellent condition for safety and confidence.
- The country will optimize the use of nuclear fuel and determine the best method for decommissioning its nuclear plants.
- Spain will make special efforts to acquire the technology and procedures for future reactor decommissioning. It will develop more advanced nuclear reactor designs for use in the intermediate- and long-term.
- Spanish nuclear research and development efforts will follow the direction of the European Economic Community and other international organizations.
- The country will encourage cooperation between companies involved in the Spanish nuclear sector and related firms in the countries of central Europe and the former Soviet Union, to promote exports and technology transfers to these markets.

ELECTRICITY GENERATION

Almost two-thirds of Spain's total energy requirements are imported, and all the country's PENs have sought to reduce this level. The electricity sector is less dependent than other sectors, with well over half generated from domestic supplies. Coal, both imported and domestic, accounts for over 40 percent of total electricity generation; nuclear power, about one-third of the total; hydroelectric, more than 20 percent; and oil and gas, the balance. Unlike most of Europe, electricity demand has grown rapidly in Spain; annual growth averaged between 3.5 and 4.0 percent in the 1980s, peaking at 5.7 percent in 1988. Recent growth has slowed comparatively, and is currently forecast to increase 3.5 percent per year until the year 2000.

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Table 2
FORECAST ELECTRICITY GENERATION BY SECTOR ACCORDING TO NEW NATIONAL ENERGY PLAN

	Electrical Production					
	1990		**1995**		**2000**	
	GWh	**%**	**GWh**	**%**	**GWh**	**%**
Hydroelectric	24,673	17.5	31,755	18.8	32,781	16.4
Nuclear	51,664	36.7	46,383	27.4	46,383	23.2
Domestic Coal	48,960	34.8	54,465	32.2	57,608	28.9
Imported Coal	6,507	4.6	7,800	4.6	11,501	5.8
Oil	2,034	1.5	6,783	4.0	0	0.0
Gas	619	0.4	0	0.0	22,612	11.3
Edf Imports	0	0.0	5,484	3.2	8,760	4.4
Cogeneration	6,267	4.5	16,567	9.8	19,964	10.0
Total	**140,724**	**100.0**	**169,237**	**100.0**	**199,609**	**100.0**
Used in Production	-1,039		-1,233		-1,240	
Exported	-425		-2,448		-3,048	
Net Total	**139,260**		**165,556**		**195,321**	

Utilities

The majority of Spain's installed generating capacity is owned by five large groups of utilities:

- HI Holding (HI)
- Unión Eléctrica-Fenosa, S.A. (Fenosa)
- Compañía Sevillana de Electricidad, S.A. (Sevillana)
- Fuerzas Eléctricas de Cataluña, S.A. (FECSA)
- Empresa Nacional de Electricidad, S.A. (ENDESA)

HI is the holding company that resulted from the recent merger of Spain's two largest private utility groups, Hidroeléctrica Española, S.A. and Iberduero, S.A. Although the Spanish government expressed concern that HI Holding would control the majority of Spain's hydroelectric capacity, the government did not prevent the merger. The new company accounts for more than 32 percent of Spanish generating capacity and 43 percent of total electricity production. This merger is representative of the trend toward consolidation within the Spanish electricity sector. **Table 3** shows current utility ownership of nuclear reactors in Spain.

In its attempt to make the Spanish electricity sector more competitive in the European Community (EC), the Spanish government has pushed for consolidation within the industry. In addition to the HI merger, ENDESA has increased its percentage ownership in a number of privately owned Spanish utilities. ENDESA is owned by the state-owned holding company Instituto Nacional de Industria (INI). The government also has stated that it will set up a holding company to manage Spain's nuclear assets. As a result of the government's consolidation plans, it acquired, by way of ENDESA, an enlarged stake in Sevillana. This increased ENDESA'S ownership percentage from 9.8 percent to over 33 percent, and with it came an increased share in the problems related to the nuclear moratorium.

The rationale behind consolidation is that once larger utilities are created from numerous smaller ones, separating electricity generating facilities from electricity distribution systems will be easier. Division of the generation and distribution assets could be accomplished with a few larger utilities, and the power producers would be more

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Table 3
CURRENT OWNERSHIP OF NUCLEAR REACTORS IN SPAIN

Reactor Name	**Location**	**Ownership (%)**
José Cabrera (Zorita)	Almonacid de Zorita (Guadalajara)	Unión Eléctrica-Fenosa, S.A. (100)
Santa María de Garoña	Santa María de Garoña (Burgos)	Nuclenor: – HI Holding (50) – Electra de Viesgo, S.A. (50)
Almaraz 1	Almaraz (Caceres)	Asociacion Central Nuclear De Almaraz: – HI Holding (52.687) – Compañia Sevillana de Electricidad, S.A. (36.021) – Unión Eléctrica-Fenosa, S.A. (11.292)
Ascó 1	Ascó (Tarragona)	Fuerzas Eléctricas de Cataluña, S.A. (60) Empresa Nacional de Electricidad, S.A. (40)
Almaraz 2	Almaraz (Caceres)	Asociacion Central Nuclear De Almaraz: – HI Holding (52.687) – Compañía Sevillana de Electricidad, S.A. (36.021) – Unión Eléctrica-Fenosa, S.A. (11.292)
Cofrentes	Cofrentes (Valencia)	HI Holding (100)
Ascó 2	Ascó (Tarragona)	Fuerzas Eléctricas de Cataluña, S.A. (40) Empresa Nacional de Electricidad, S.A. (40) Hidroeléctrica de Cataluña, S.A. (15) Fuerzas Eléctricas del Segre, S.A. (5)
Vandellós 2	Vandellós i l'Hospitalet de l'Infant (Taragona)	Asociacion Nuclear Vandellos: – Empresa Nacional de Electricidad, S.A. (72) – Hidroeléctrica de Cataluña, S.A. (28)
Trillo 1	Trillo (Guadalajara)	Union-Fenosa S.A. (46.5) HI Holding (46.5) Hidroeléctrica del Cantabrico, S.A. (7)
Lemoniz 1 & 2 (deferred)	Lemoniz (Bilbao)	HI Holding (100)
Valdecaballeros 1 & 2 (deferred)	Valdecaballeros (Badajoz)	HI Holding (50) Compañía Sevillana de Electricidad, S.A. (50)

competitive. Claudio Aranzadi, the current minister for energy and industry, has made it clear that the separation of generation and distribution assets will be imposed by way of law. He has said that once the new National Energy Plan has been approved by the Spanish Parliament, the government will be able to introduce the *Ley De Bases Del Sector Eléctrico* (Electricity Sector Base Law), forcing a split between generation and distribution. In essence, the utility groups will be divided into "wholesalers" and "retailers" of power. Although the private electricity companies are reluctant to agree to this split, the government considers it vital to enable Spain's electricity sector to meet the more competitive demands of a single energy market in Europe. An additional motivation

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behind the utility restructuring and government assumption of nuclear assets is to share/write-off the debt created by the nuclear plant deferrals. **Table 4** shows a recent forecast of the future distribution of nuclear assets in Spain, done by Empresa Nacional del Uranio S.A.

NUCLEAR POWER PROGRAM

In the early 1960s, the Spanish government initiated a multi-phase nuclear power program. The program was designed to conduct industry-related research and development, to participate in the construction of nuclear power plants, and to supply nuclear fuel to Spanish utilities. The program was later expanded to include involvement in uranium exploration, exploitation, and enrichment services outside of Spain.

A Spanish utility placed its first order for a nuclear power plant in 1964. Construction began in 1965, and in February 1969 José Cabrera (originally known as Zorita), a 153-MWe pressurized water reactor, located just east of Madrid (**Figure 1**), reached commercial operation. By 1972, three nuclear power plants were operating with a combined capacity of 1,100 MWe. Seven additional plants came on line in the 1980s, and Spain currently has nine operating

Table 4
FUTURE DISTRIBUTION OF SPANISH NUCLEAR ASSETS[1]

	Reactor									
	José Cabrera	**Goroña**	**Almaraz 1**	**Almaraz 2**	**Ascó 1**	**Ascó 2**	**Cofrentes**	**Vandellós 2**	**Trillo 1**	**TOTAL**
MWE	153	440	895	895	930	930	939	943	990	**7,115**
UTILITY GROUP										
ENDESA										
TOTAL MWe	—	**220**	**322**	**322**	**930**	**744**	—	**679**	—	**3,217**
TOTAL %	—	**50**	**36.021**	**36.021**	**100**	**80**	—	**72**	—	**45**
–FECSA[2]	—	—	—	—	60	40	—	—	—	
–Sevillana[3]	—	—	36.021	36.021	—	—	—	—	—	
–Viesgo[4]	—	50	—	—	—	—	—	—	—	
–Endesa[5]	—	—	—	—	40	40	—	72	—	
IBERDROLA										
TOTAL MWe	—	**220**	**472**	**472**	—	**140**	**939**	**264**	**460**	**2,967**
TOTAL %	—	**50**	**52.687**	**52.687**	—	**15**	**100**	**28**	**46.5**	**42**
–HI Holding	—	50	52.687	52.687	—	—	100	—	46.5	
–Hidruña[6]	—	—	—	—	—	15	—	28	—	
UNION FENOSA[7]										
TOTAL MWe	**153**	—	**101**	**101**	—	—	—	—	**460**	**815**
TOTAL %	**100**	—	**11.292**	**11.292**	—	—	—	—	**46.5**	**11**
OTHERS										
TOTAL MWe	—	—	—	—	—	**46**	—	—	**70**	**116**
TOTAL %	—	—	—	—	—	**5**[8]	—	—	**7**[9]	**2**

[1] Source of forecast distribution: ENUSA

[2] Fuerzas Eléctricas de Cataluña, S.A.

[3] Compañía Sevillana de Electricidad, S.A.

[4] Electra de Viesgo, S.A.

[5] Empresa Nacional de Electricidad, S.A.—ENDESA holds 89 percent of Viesgo, 33.5 percent of Sevillana, and 40 percent of FECSA

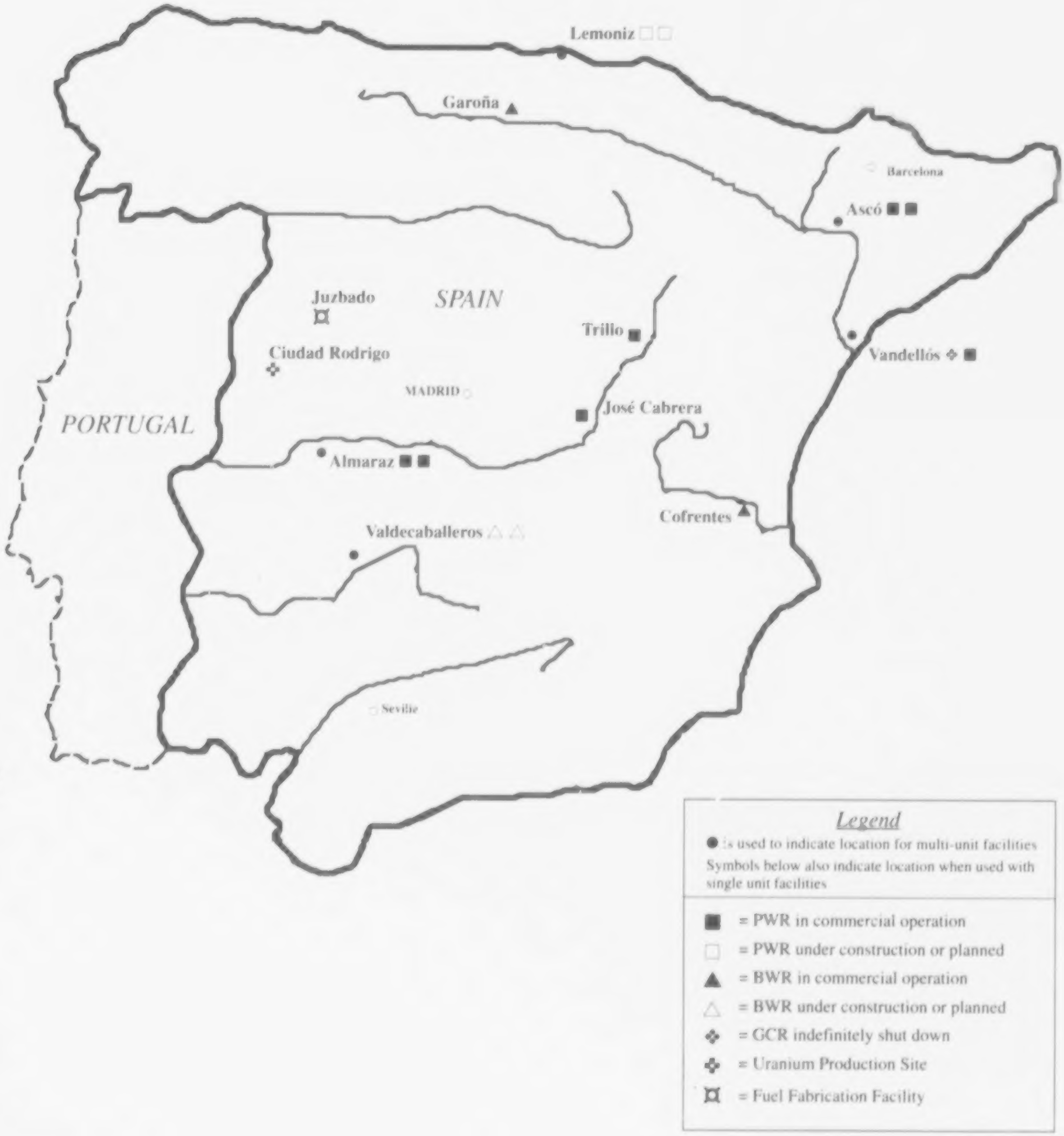
[6] Hidroeléctrica de Cataluña, S.A.

[7] Unión Eléctrica-Fenosa, S.A.

[8] Fuerzas Eléctricas del Segre, S.A.

[9] Hidroeléctrica del Cantabrico, S.A.

Figure 1
NUCLEAR POWER UNITS AND FUEL CYCLE FACILITIES IN SPAIN


Lemoniz □ □
Garoña ▲
Barcelona
Ascó ■ ■
Juzbado ⌑
SPAIN
Trillo ■
Ciudad Rodrigo ✣
Vandellós ✥ ■
MADRID
José Cabrera ■
PORTUGAL
Almaraz ■ ■
Cofrentes ▲
Valdecaballeros △ △
Seville
Legend
● is used to indicate location for multi-unit facilities
Symbols below also indicate location when used with single unit facilities
■ = PWR in commercial operation
□ = PWR under construction or planned
▲ = BWR in commercial operation
△ = BWR under construction or planned
✥ = GCR indefinitely shut down
✣ = Uranium Production Site
⌑ = Fuel Fabrication Facility

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nuclear reactors. Of the reactors in operation, seven are pressurized water reactors (PWR), and two are boiling water reactors (BWR). These reactors supplied about one-third of the country's electricity in 1991. Under the framework established by the latest Energy Plan, it is estimated that by the year 2000 nuclear's share of total gross electricity production will fall from nearly 37 percent in 1990 to approximately 23 percent, as no additional nuclear capacity is expected to come on line in this decade (**Table 2**).

Operating Nuclear Plants

The José Cabrera unit, built by Westinghouse, is the oldest commercial reactor in Spain and is operated by the utility Unión Eléctrica-Fenosa, S.A. The Garoña unit, a 440-MWe BWR built by General Electric in northern Spain (**Figure 2**), was Spain's second reactor and was brought into commercial operation in May 1971.

Vandellos 1, a 480-MWe GCR, went into commercial operation in August 1972. This reactor is similar to the gas-cooled reactors built in France, and was built and

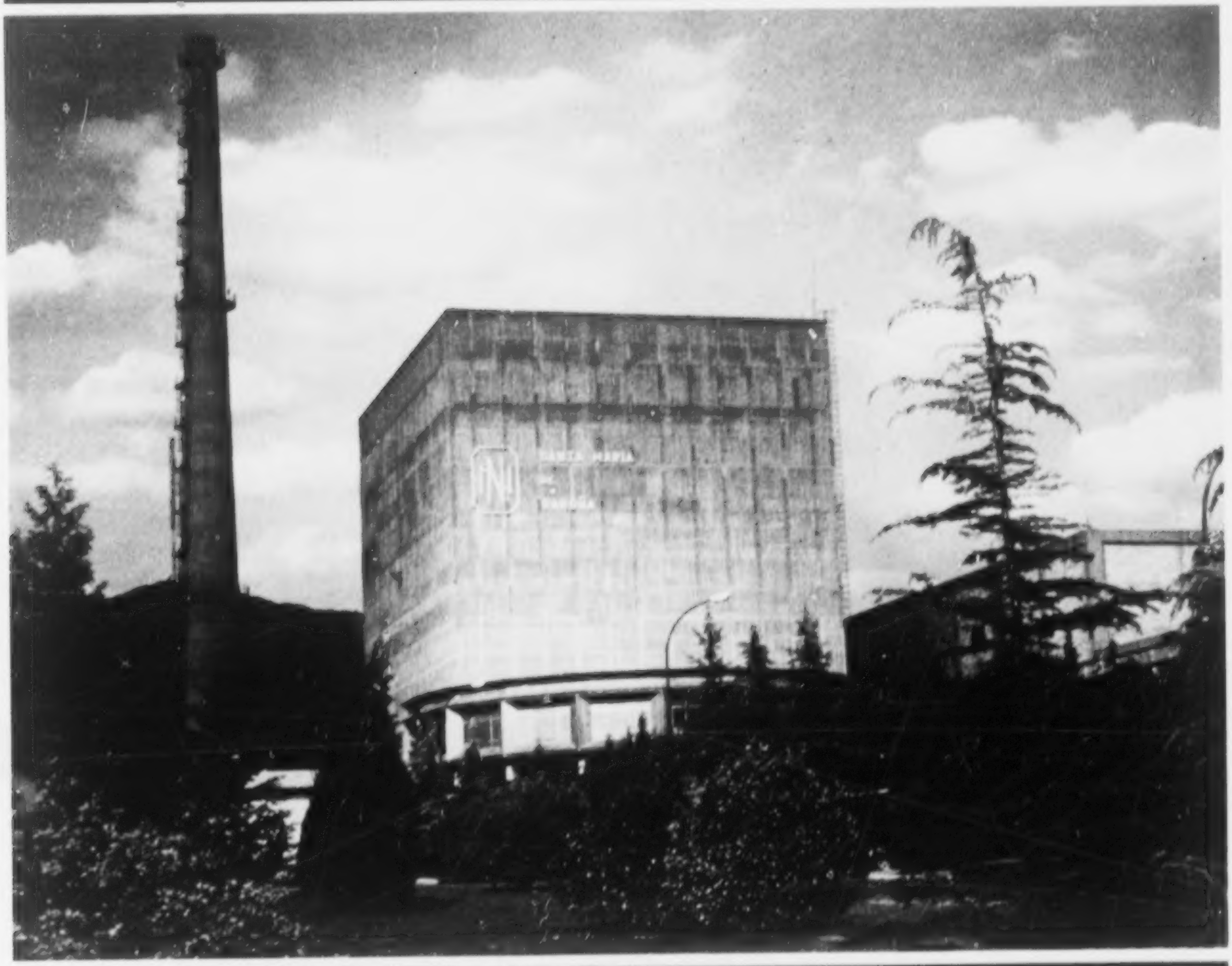

Figure 2 — Garoña Nuclear Power Station. This 440-MWe BWR achieved a 96 percent capacity factor during 1991. (*Photo courtesy of ENUSA*)

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operated by Sociedad Hispano-Francesa de Energía Nuclear, S.A. (HIFRENSA), a Spanish-French joint venture company. In October 1989, an oil-based fire in the turbine hall of Vandellos 1 caused widespread damage to the plant. The fire also re-ignited controversy regarding nuclear power in Spain. Emotional, and often conflicting, reports issued by both pro- and anti-nuclear groups led to confusion of the local community and pressure to close the plant permanently. In June 1991, the Spanish government responded to public opinion and announced the permanent closure of the Vandellos 1 plant.

Spain's nine operating nuclear reactors achieved an average capacity factor of about 86 percent in 1991. They generated a total of 53,265 GWh of power over the year (**Table 5**). Almaraz 1 and Garoña each achieved a capacity factor of 96 percent during the year, ranking them in the top 15 in the world in that category.

With its earliest reactors all built by vendors from other countries, Spain decided to begin to develop its own nuclear fuel cycle industry. The country's next seven reactors used General Electric (BWR) and Westinghouse (PWR) designs, but had increasing local involvement and transfer of technology to Spanish firms, reaching as high as 85 percent local content in some of the later plants.

Table 5
NUCLEAR POWER UNITS IN SPAIN

Units In Operation

Unit	Lead Utility or Fuel Buyer	Capacity (MWe net)	Type	COD[1]	1991 Capacity Factor (percent)	Total 1991 Electricity Generation (GWh net)
Almaraz 1	ENUSA[2]	895	PWR	1981	96	7,470
Almaraz 2	ENUSA	895	PWR	1984	86	6,711
Ascó 1	ENUSA	930	PWR	1983	83	6,778
Ascó 2	ENUSA	930	PWR	1986	83	6,753
Cofrentes	ENUSA	939	BWR	1985	85	6,956
Garoña	ENUSA	440	BWR	1971	96	3,684
José Cabrera[3]	ENUSA	153	PWR	1969	79	1,056
Trillo 1	ENUSA	990	PWR	1988	77	6,655
Vandellós 2	ENUSA	943	PWR	1988	87	7,202
TOTAL		**7,115**		***(1991 Average:***	**85)**	**53,265**

Units Deferred

Unit	Lead Utility or Fuel Buyer	Capacity (MWe net)	Type	Percent Complete[4]
Valdecaballeros 1	ENUSA	930	BWR	71
Valdecaballeros 2	ENUSA	975	BWR	58
Lemoniz 1	Iberduero	900	PWR	97
Lemoniz 2	Iberduero	900	PWR	57
TOTAL		**3,705**		

[1] COD = Commercial Operation Date

[2] ENUSA = Empresa Nacional del Uranio SA

[3] Also known as Zorita

[4] Source: *Nuclear News*

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Plant Deferrals

Following the election of the socialist government in 1982, several nuclear plants were deferred or cancelled. The official Nuclear Energy Plan announced by the government in 1984 called for the indefinite deferral of five reactors under construction and two in the planning stages. Among these deferred units were the twin Lemoniz PWRs in the Basque country of northern Spain. Lemoniz 1 was nearly complete (97 percent) and Unit 2 was 57 percent complete when cancelled. The government had temporarily shelved the Lemoniz project in 1982 due to local opposition. The Lemoniz station has remained shutdown since the publication of the 1984 PEN, and Iberduero, S.A. (now HI Holding), the utility in charge of the project, has sold Lemoniz plant components in recent years.

Another controversial station that was deferred was the two-unit Valdecaballeros station, which was also over half complete. Unlike Lemoniz, the Valdecaballeros reactors are being maintained for possible resumption of construction. However, public allegations made in 1983 by plant technicians that the plant had been built with defects, added controversy to the plant's future. The utility in charge of the project, Hidroeléctrica Española (now HI Holding) contested the charges, but the allegations added support to the government's moratorium.

The fifth unit deferred or cancelled under the 1984 PEN was Trillo 2, while it was in the early stages of construction. Construction on the 997-MWe PWR was stopped when the unit was about five percent complete.

The construction moratorium has been costly for the country's utilities. A fund financed by surcharges on electricity rates was established to help compensate the utilities for their idled investment. The payments are shared by the project owners, based on the size of investment made by a given utility. However, the resulting payments have not been large enough to cover the costs required to maintain units for possible resumption of construction. Thus, how much longer the Valdecaballeros units will be maintained for possible future operation is becoming increasingly uncertain. Even if construction were to begin again soon, hundreds of millions of dollars of upgrades would be required to bring the units up to current design standards. The recognized debt for each of the sites is given in **Table 6**.

Table 6
RECOGNIZED DEBT FOR NUCLEAR SITES

Nuclear Station	Psetas (millions)	Dollars (millions)
Lemoniz	335,761	3,232
Trillo	10,823	104
Valdecaballeros	278,759	2,683
Total	**625,343**	**6,019**

According to the Minister of Industry and Energy, the five deferred or cancelled plants will be amortized over 25 years, as if they were in operation. The cost of amortizing the debt may be incorporated into annual electricity price increases. The owners of these plants are pushing for an accelerated amortization period of ten years, insisting that the government has undervalued the plants.

FUEL CYCLE CONTRACTING

Organization

Spain's nuclear program is under the supervision of the Ministry of Industry and Energy (MIE). The functionary agencies within the MIE include the state-owned Centro de Investigacion Energética, Medioambiental y Technología (CIEMAT) [formerly the Junta de Energía Nuclear (JEN)], and Empresa Nacional del Uranio S.A. (ENUSA). JEN was formed in the 1950s for the purpose of prospecting and exploring for uranium within Spain. ENUSA, owned by INI (60 percent) and CIEMAT (40 percent), was originally created to exploit the uranium ore deposits in Spain discovered by JEN. After the oil crisis in November 1973, ENUSA's mission was extended to include the development of all nuclear fuel cycle activities. Its responsibilities encompass uranium exploration, all mining and milling, conversion, enrichment, and fuel fabrication. In addition, it actively participates in uranium ventures and procurement outside of Spain. The company is responsible for procuring fuel for all Spanish reactors in operation.

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Uranium Concentrates

When ENUSA was originally formed, fuel contracts were in the hands of individual utilities. In 1973, ENUSA began taking assignment of contracts from the utilities, and directly signed new contracts as old ones ended. Spain's uranium supply policy has been based on diversification of supply sources, with ENUSA obtaining uranium concentrates through domestic production, participation in mines outside Spain, and long-term contracts. The 1975 nuclear program, which forecast 22 GWe of nuclear capacity in operation by 1985, led ENUSA to sign long-term contracts for substantial foreign supplies. The 1979 forecast reduced installed nuclear power capacity estimates to 10.5 GWe by 1987, and delays also began to occur in the seven reactors then under construction. The result was a uranium oversupply situation. Through a series of renegotiations with suppliers, and an aggressive supply management program, ENUSA has been able to stabilize its supply situation in recent years.

Through participation in foreign uranium projects, ENUSA has ensured long-term uranium supplies for Spain, while also developing domestic uranium production. The company carried out uranium exploration during 1976-1981 in Canada, South Africa, and Colombia. In 1975, it acquired a 12.5-percent participating interest in the Conwest Canadian Uranium Exploration Joint Venture in Saskatchewan and Quebec. It also had a 25-percent interest in an exploration joint venture in the Karoo district in South Africa, and a 49-percent interest in a joint venture with the Colombian Institute de Asuntos Nucleares, an organization that conducts exploration activities in Colombia. ENUSA currently has a ten percent stake in Compagnie Minière d'Akouta (Cominak), owner of the Akouta mine in Niger.

Domestically, ENUSA produced uranium from its mills at La Haba and Ciudad Rodrigo. The La Haba mill was shut down in 1990. ENUSA is currently overseeing a major expansion of its production facilities near Ciudad Rodrigo in Salamanca province. This expanded mine and mill will have a nominal production capacity of 2.1 million pounds equivalent U_3O_8 per year and be able to supply most of Spain's future uranium requirements domestically.

Conversion Services

ENUSA originally had planned to build its own conversion facility; however, after the necessary studies were completed, the nuclear program had slowed sufficiently to postpone the project indefinitely. Consequently, ENUSA signed flexible long-term contracts with several converters.

Enrichment Services

Enrichment supply policy also was based on diversification of supply sources and on maintaining a permanent enriched uranium stockpile. From 1973 through 1975, ENUSA signed various long-term contracts with the US Atomic Energy Commission and with Techsnabexport of the Soviet Union. It also purchased an 11.1 percent interest in Eurodif, entitling it to a portion of the enrichment services from the gaseous diffusion plant near Pierrelatte, France.

The events that produced the surplus of natural uranium, also produced an undesired surplus of enrichment services. Through changes in its type of DOE contract and through agreements with ENUSA's other two enrichment suppliers, an acceptable supply situation has been reached in recent years. Currently, the company buys most of its enrichment from DOE and Techsnabexport. Although it still holds its interest in Eurodif, ENUSA is unlikely to purchase significant SWU quantities in the coming years.

Fuel Fabrication

ENUSA operates its own fuel fabrication facility (**Figure 3**) at Juzbado in Salamanca province. It produces both BWR and PWR fuel elements under General Electric and Westinghouse licenses. The plant has three production lines: two for PWR-type products, and one for BWR-type products. ENUSA has had fuel design capability since 1978, but due to delays in obtaining construction and operation permits, construction on the fabrication plant did not begin until 1981. The plant began manufacturing in mid-1985 with a capacity exceeding 200 MTU per year, which can be expanded to 500 MTU per year. ENUSA does not have oxide conversion facilities, so it subcontracts oxide conversion abroad, primarily with British Nuclear Fuels plc (BNFL) and GE. All fuel for Spanish reactors, except for Trillo 1, is manufactured domestically. Siemens/Kraftwerk

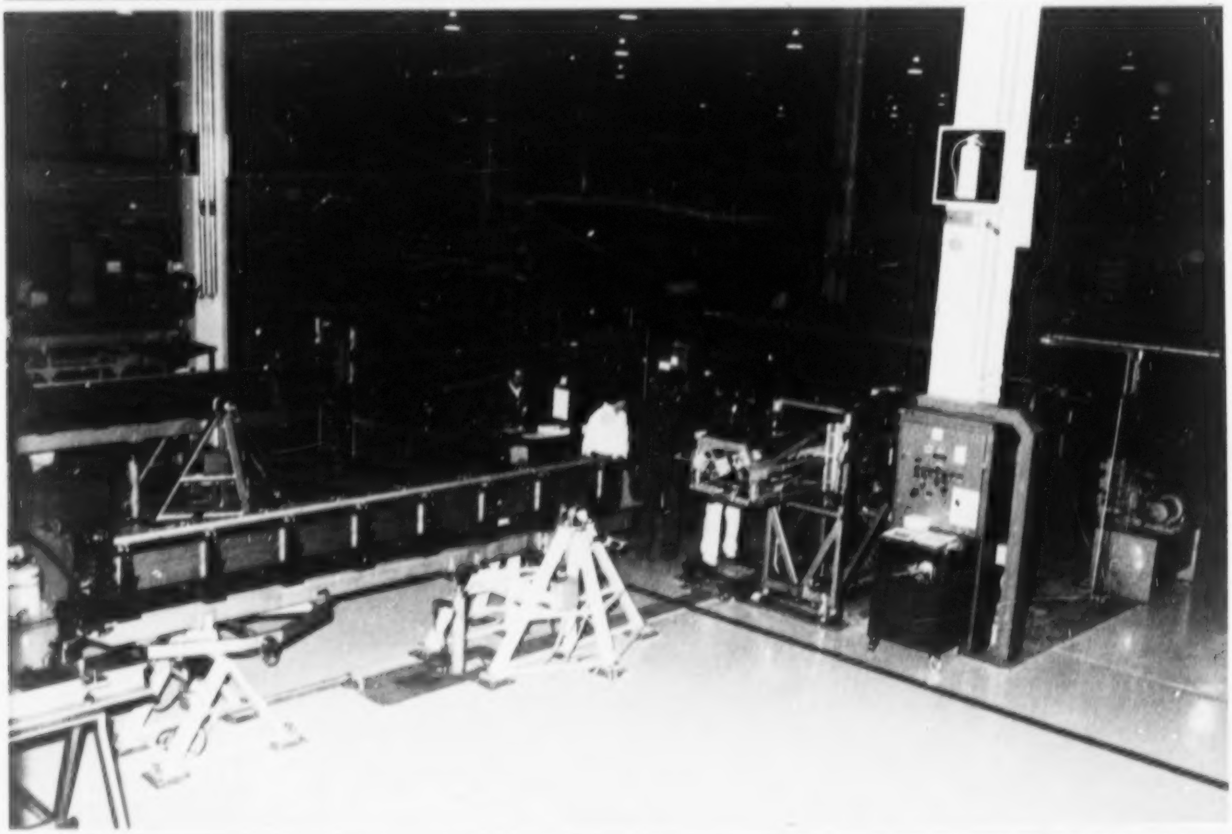

Figure 3 — Juzbado Fuel Fabrication Facility. Located in Salamanca province, it produces both BWR and PWR fuel elements under General Electric and Westinghouse licenses. *(Photo courtesy of ENUSA)*

Union will supply five reloads for Trillo 1 from 1992 through 1996. These reloads will be made up of newly designed *Focus* fuel assemblies with Zircaloy spacer grids, which have mixing vanes that improve thermohydraulic margins to operating limits.

In an attempt to firmly establish itself in the European market for PWR fuel, ENUSA joined with Westinghouse and BNFL to form the European Fuel Group (EFG) in 1991. EFG is a cooperative agreement among the three companies in which they will pool their resources for the marketing, design, and manufacture of PWR fuel for the European market. Although each of the companies will separately negotiate contracts, the work will be assigned to the appropriate member of EFG.

Spent Fuel Management

For Spain's first light water reactors, Zorita and Garoña, the utilities initially had reprocessing contracts with BNFL covering a period of several years. When these contracts expired, the economics of new contracts were not attractive, so the utilities ceased contracting for fuel element reprocessing. Vandellos 1, the French-designed gas-cooled reactor, maintained a reprocessing contract with Cogema, as the reactors' fuel elements could only tolerate a short storage period due to potential corrosion problems.

In 1985, fulfilling the direction given by the 1983 PEN, the Spanish Parliament established a state-owned, limited company in charge of nuclear and other radioactive waste

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management called Empresa Nacional de Residuos Radioactivos S.A. (ENRESA). Its only shareholders are government organizations under MIE—CIEMAT (80 percent) and INI (20 percent).

In October 1987, the Spanish government approved the first General Radioactive Waste Plan (Planes Generales de Residuos Radiactivos—PGRR). The third, and current PGRR has the following strategy:

Medium- and Low-Level Wastes

Presently, medium- and low-level wastes are being stored in a facility at El Cabril in Cordoba province (**Figure 4**). The facility is currently being expanded to have sufficient capacity to store the domestic production of this type of waste beyond the year 2000. Expansion was authorized by MIE in 1989. The project, scheduled to begin operation in 1992, includes a medium- and low-level activity waste processing plant and a laboratory.

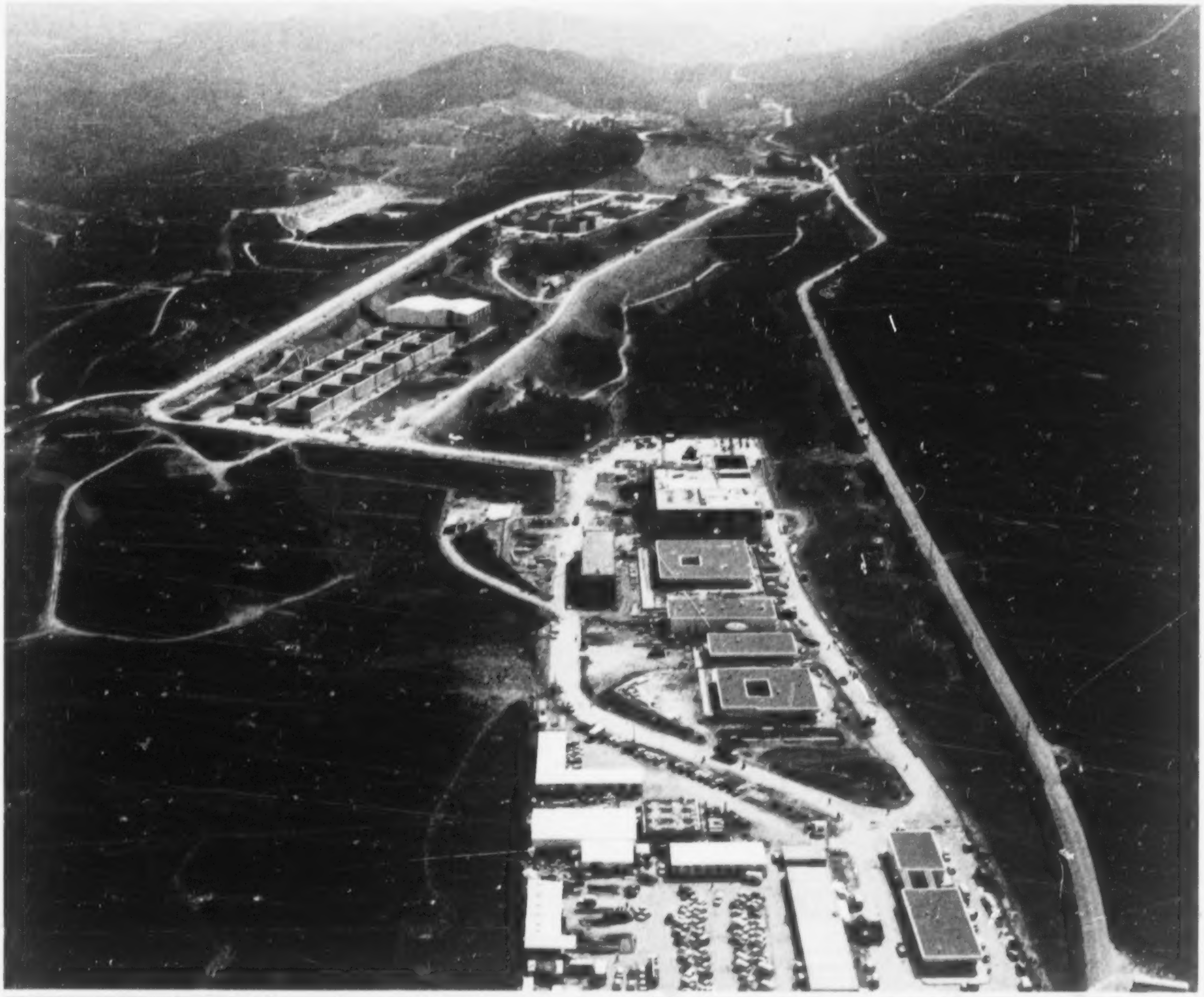

Figure 4 — El Cabril Medium- and Low-Level Waste Storage Site. (*Photo courtesy of ENRESA*)

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High-Level Wastes

For intermediate storage of spent fuel, projects are in progress to change the spent fuel racks in the fuel pools at the Almaraz and Asco plants in order to expand their storage capacity. The projects are expected to be finalized by the year 1993.

ENRESA has been working in the high-level waste field since 1986, and has determined that viable techniques include dry storage in containers or in pools. Centralized temporary storage also is among the solutions that have been considered, for which there is already a preliminary plan, although no specific location is listed. Included in the plan is the construction of a research and development plant for the study of spent fuel.

Through the use of foreign technology, ENRESA has started the process of licensing and fabricating spent fuel transportation and storage containers in Spain. The first container made in the country will be available this year.

Although Spain currently has no facilities for final storage of spent fuel, ENRESA appears convinced of the technical viability of storage in deep geological formations. Forecasts estimate that additional storage capacity for spent fuel may be needed as early as 1993. To accommodate these wastes, ENRESA is performing studies to define the characteristics of the additional capacity, as well as planning a deep geological site for disposal of high-level wastes.

ENRESA is developing a plan to select several sites in order to have a few potential localities for underground storage of high-level wastes by the end of the decade. Under this plan, the spent fuel produced by nuclear power plants, and the high-level waste from fuel cycle facilities must be conditioned by the owners according to the technical specifications of ENRESA. The waste will then be stored in ENRESA's centralized facilities.

Outlook

Nuclear power remains an important part of Spain's energy mix, although the outlook for additional nuclear plants remains uncertain. Before the Chernobyl accident, the anti-nuclear position of the Socialist government had been gradually shifting toward a renewed program. Following the accident, however, public opinion forced a reversal of the government's policy on nuclear power. Debate about nuclear power was again revived after the fire at Vandellos 1 in 1989. The Agrupación de Municipios Afectados por Centrales Nucleares, the association of townships sited within a ten-kilometer radius of Spain's nine fully functioning power plants, is angry over the confusion on the night of the fire and has launched an urgent campaign to get parliament and the Nuclear Safety Council to pass more stringent legislation and provisions for nuclear safety, mainly regarding nuclear emergency plans.

The future of nuclear power in Spain also will be strongly influenced by the process of integration into the EC. A long-term objective of the Spanish government is to increase the efficiency of state commercial enterprises, in order to improve their competitiveness once the integration of the EC single market is complete. Given the consolidation in the electricity sector, increased government ownership of deferred nuclear units, and rapidly growing electricity demand, nuclear power must be seriously considered as a way of meeting Spain's future energy needs.

Michael F. Ferguson

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NUCLEAR INDUSTRY CALENDAR

1992	
May 4-6	***Nuclear Power Assembly '92*** (Capitol Hill Hyatt Regency, Washington, DC). Sponsored by the American Nuclear Energy Council. — Contact: Diane Holmes; 202-484-2670
May 5-7	***Annual Meeting on Nuclear Technology '92*** (City Conference Hall, Karlsruhe, Germany). Sponsored by the German Nuclear Society and the German Atomic Forum. Contact: Congress Office JK'92; INFORUM GmbH, Heussallee 10, W-5300 Bonn 1; Phone: 0228-507-223.
May 17-19	***19th Annual Meeting & Int'l Conference on Nuclear Energy*** (Hotel Diplomat, Prague, CSFR). Sponsored by World Nuclear Fuel Market. Contact: Donna Cason; 404-447-1144; Fax: 404-447-1797.
June 7-11	***American Nuclear Society Annual Meeting*** (Boston Marriott, Copley Place, Boston, Massachusetts). Contact: ANS Meetings Department; 708-352-6611.
June 23-24	***Nuclear Forum '92*** (Royal Garden Hotel, London, United Kingdom). Sponsored by the British Nuclear Forum. Contact: Ms. Ipek Yigit, Manager for Public and Industrial Affairs, British Nuclear Forum; phone: 071-828-0116; Fax: 071-828-0110; Address: 22 Buckingham Gate, London, SW1E 6LB, England.
Sept. 9-11	***Uranium Institute 17th Annual Symposium*** **(London, United Kingdom).** Contact: 44-71-225-0303; Fax: 44-71-225-0308.
Sept. 20-23	***International Uranium Seminar '92*** (Hyatt Regency Hotel, Lake Tahoe, Nevada). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 21-23	***2nd International Conference on Training for Operation & Maintenance in the Nuclear Industry*** (The Moat House International Hotel, Stratford-upon-Avon, United Kingdom). Sponsored by the Institution of Nuclear Engineers. Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.
Sept. 29- Oct. 1	***Crisis/Emergency Information Planners' Workshop*** (Loews L'Enfant Plaza, Washington DC) Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Oct. 18-22	***AMC Mining Convention*** (Las Vegas, Nevada) — Sponsored by the American Mining Congress. Contact: AMC Convention Office; 202-861-2800; Fax: 202-861-7535.
Oct. 19-23	***International Symposium on Geological Disposal of Spent Fuel, High-level and Alpha-bearing Wastes*** (Antwerp, Belgium). — Sponsored by the International Atomic Energy Agency. Contact: IAEA, P.O. Box 100, A-1400 Vienna, Austria.
Nov. 15-18	***International Nuclear Energy Forum*** (Fairmont Hotel, Chicago, Illinois). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Nov. 15-20	***American Nuclear Society Winter Meeting*** (McCormick Center Hotel, Chicago, Illinois). Contact: ANS Meetings Department; 708-352-6611.

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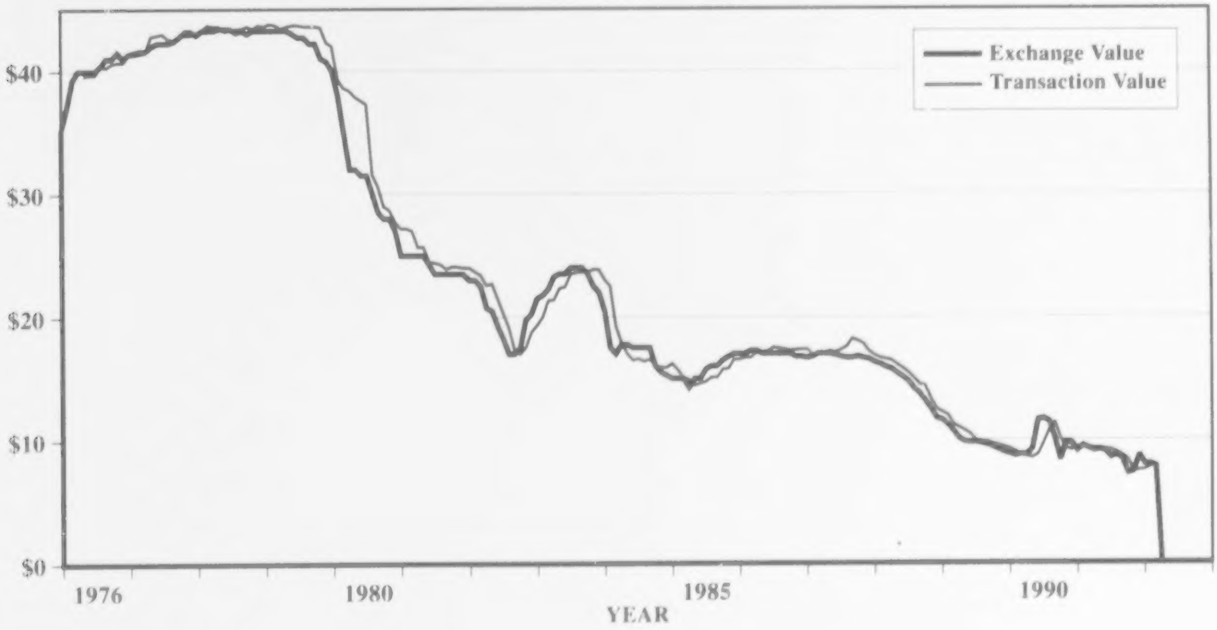
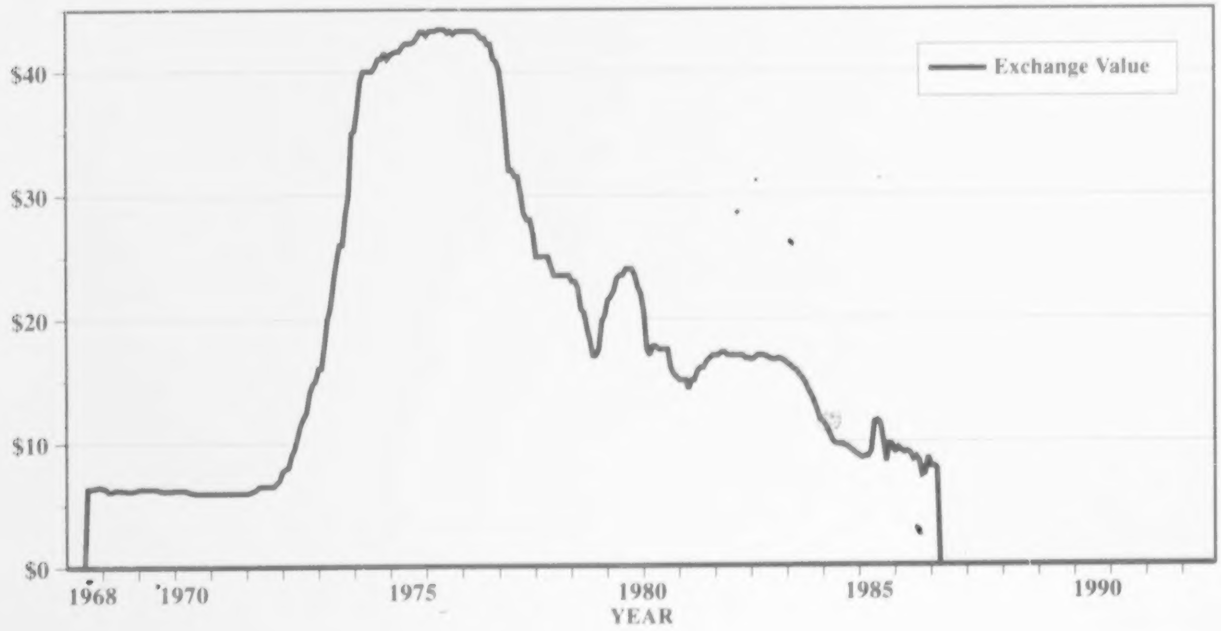
NUEXCO Historical Exchange Value and Transaction Value

(in US dollars per pound U_3O_8)





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HISTORICAL MARKET VALUES

Exchange Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.60	27.00
1981	25.00	25.00	25.00	25.60	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	9.80	9.70
1991	9.10	9.50	9.30	9.10	9.20	9.05	8.55	8.75	8.40	7.25	7.40	8.75
1992	8.00	8.00	**7.85**									

US Premium (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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UF₆ Values

Determined as of the last day of the month indicated ($US/kg U as UF₆)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29.50	24.75	28.75	28.75
1991	27.50	27.75	27.50	27.25	27.60	27.25	25.75	26.25	25.50	22.75	22.75	26.00
1992	24.50	24.25	**24.00**									

US Premium (Relative to the UF₆ Value)

Determined as of the last day of the month indicated ($US/kg U as UF₆)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

Conversion Values

Determined as of the last day of the month indicated ($US/lb U as UF₆)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
1991	1.45	1.45	1.45	1.45	1.50	1.50	1.50	1.60	1.55	1.55	1.55	1.55
1992	1.60	1.60	**1.60**									

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HISTORICAL MARKET DATA

Transaction Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	9.30	9.15
1991	9.40	9.45	9.35	9.30	9.30	9.20	9.15	8.95	8.70	8.35	7.45	7.50
1992	7.55	7.80	**7.95**									

SWU Values

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	51	51
1991	51	50	52	52	54	59	66	67	67	68	68	70
1992	71	70	**69**									

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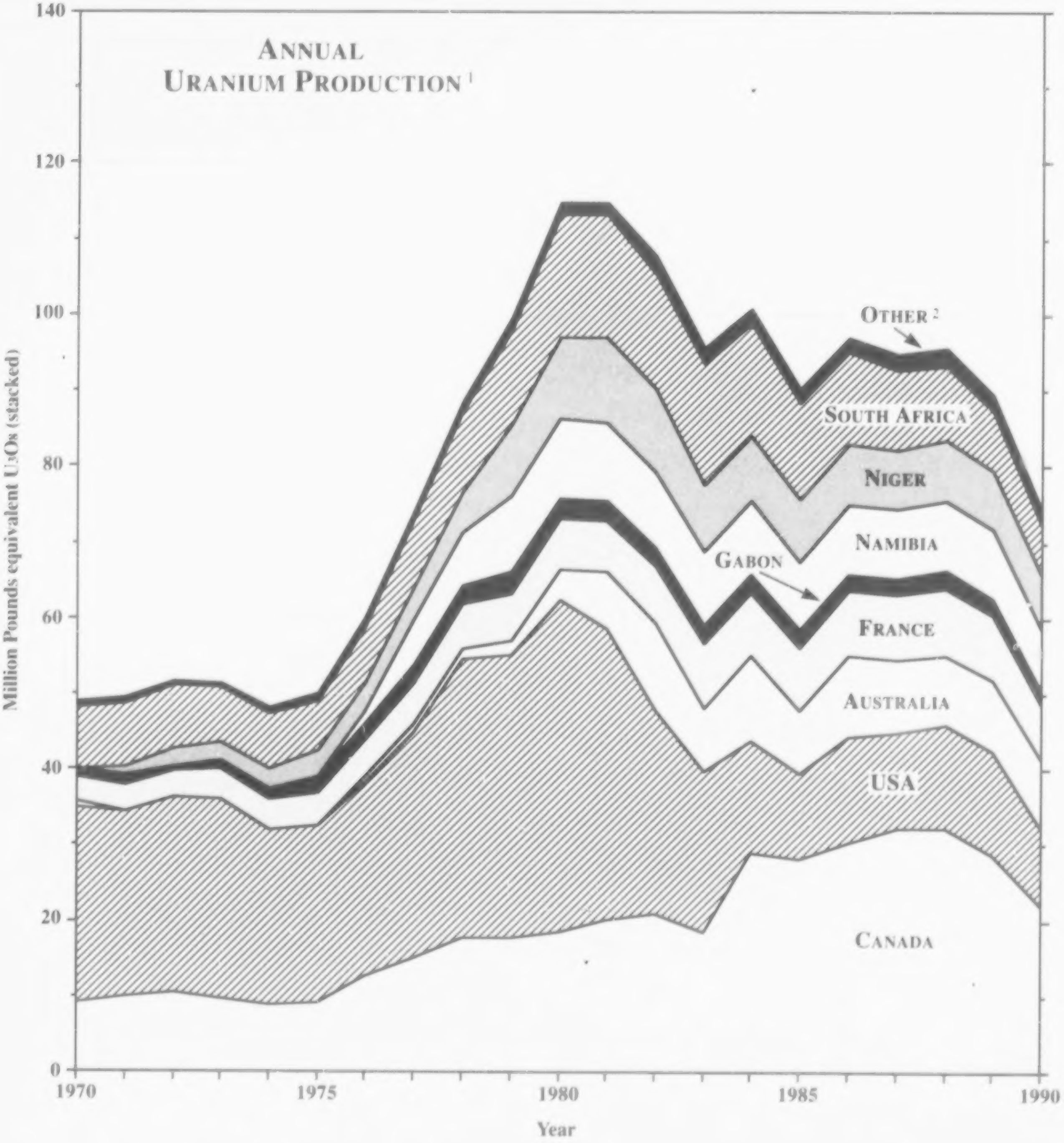
Loan Rates

Determined as of the last day of the month indicated (Percent per Annum)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1991	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.00
1992	3.00	3.00	**3.00**									

* Float with Prime Rate



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[1] Estimated western world uranium production in 1990 totalled 74.5 million pounds equivalent U_3O_8 —
(Australia: 9.1 – Canada: 22.0 – France: 7.4 – Gabon: 1.8 – Namibia: 8.0 – Niger: 7.4 – South Africa: 6.4 – USA: 10.2 – Other[2]: 2.2)

[2] **Other** includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, former West Germany, and Yugoslavia (Slovenia)

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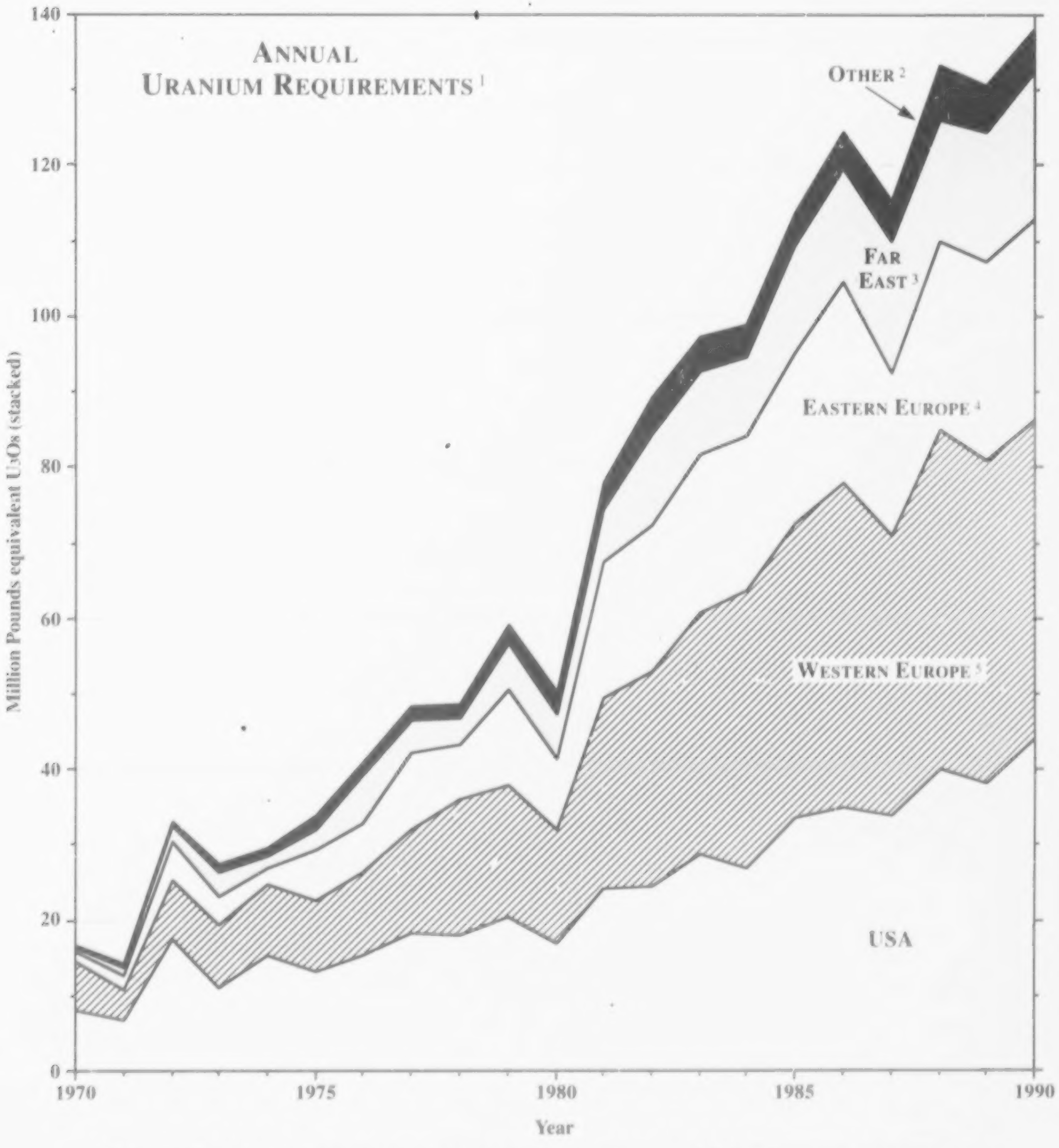

[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assay.

[2] **Other** includes: Argentina, Brazil, Canada, India, Mexico, Pakistan, and South Africa.

[3] **Far East** includes: Japan, People's Republic of China, South Korea, and Taiwan.

[4] **Eastern Europe** includes: Bulgaria, Czechoslovakia, former East Germany, Finland, Hungary, former Soviet Union, and Yugoslavia (Slovenia).

[5] **Western Europe** includes: Belgium, France, former West Germany, Italy, The Netherlands, Spain, Sweden, Switzerland, and UK.

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Australia

Year	Period[1]	Consumer Price Index[2] (1980/1981 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia[4] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[5] (June 1985=100)
1980	Avg.	95.8	83.1	—	69.6
1981	Avg.	105.0	85.9	—	76.1
1982	Avg.	116.7	89.0	—	86.4
1983	Avg.	128.5	96.9	—	89.9
1984	Avg.	133.6	98.0	—	96.0
1985	Avg.	142.6	107.3	—	100.0
1986	Avg.	155.5	101.5	—	104.9
1987	Avg.	168.7	108.9	465.88	112.9
1988	Avg.	180.9	111.8	496.90	115.4
1989	Avg.	194.6	117.0	534.65	126.0
1990	Avg.	208.7	123.4	571.43	129.7
1991	Avg.	215.5	120.1	600.35	133.8
Jan	1991	—	125.6	—	133.0 **R**
Feb	1991	—	121.5	597.70	133.0 **R**
Mar	1991	214.1	119.1	—	133.3 **R**
Apr	1991	—	117.6	—	133.5 **R**
May	1991	—	117.8	592.00	133.5 **R**
June	1991	214.4	120.4	—	133.6 **R**
July	1991	—	120.4	—	133.6 **R**
Aug	1991	—	119.9	599.50	134.0 **R**
Sept	1991	215.7	118.3	—	134.3 **R**
Oct	1991	—	118.7	—	134.4 **R**
Nov	1991	—	120.6	612.20	134.5 **R**
Dec	1991	217.7	121.2	—	134.6
Jan	1992	—	120.9	—	134.6

P = Preliminary **R** = Revised since last month

[1] Monthly data for the period 1967 to 1990 appears in Report 278.

[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1980 to June 1981 = 100.0). Figures shown at end of quarter represent quarterly average.

[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0).

[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (Catalogue No. 6312.0). Figures for the latest fourteen months shown are subject to revision.

[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (Catalogue No. 6302.0).

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Canada

		Industrial Products Price Index: All Commodities[1] (1986 = 100)[2]	Consumer Price Index: All Items (1986 = 100)[3]	Wage-earner Data: Average Hourly Earnings (C$)[4]				
				Uranium Mines (SIC 057)	Metal Mines (SIC 051-059)	Mines, Quarries and Oil Wells (SIC 051-099)	Metal Rolling, Casting and Extruding (SIC 298)	Chemicals and Chemical Products Industries (SIC 372-379)
1980	Avg.	75.9	67.2	—.—	—.—	—.—	—.—	—.—
1981	Avg.	83.6	75.5	—.—	—.—	—.—	—.—	—.—
1982	Avg.	89.0	83.7	—.—	—.—	—.—	—.—	—.—
1983	Avg.	92.1	88.5	17.22	14.86	14.18	10.67	11.09
1984	Avg.	96.3	92.4	17.89	15.85	14.97	11.11	11.68
1985	Avg.	99.0	96.0	18.53	16.47	15.56	11.85	12.12
1986	Avg.	100.0	100.0	19.38	16.70	15.76	12.28	12.58
1987	Avg.	102.8	104.4	20.12	17.15	16.11	12.58	13.20
1988	Avg.	107.2	108.6	20.91	18.51	16.95	13.17	13.77
1989	Avg.	109.4	114.0	21.97	20.02	18.41	13.71	14.16
1990	Avg.	109.7	119.4	22.90	20.93	19.12	14.62	15.28
1991	Avg.	108.7	126.2	24.35 **R**	22.27 **R**	20.28 **R**	14.83	16.45
Jan	1991	111.1	125.0	23.79	21.79	19.78	14.66	15.89
Feb	1991	110.6	125.0	25.23	22.45	20.13	14.63	16.10
Mar	1991	109.8	125.5	24.19	22.22	20.27	15.21	16.47
Apr	1991	109.1	125.5	24.77	22.50	20.31	14.63	16.64
May	1991	108.6	126.1	24.38	22.17	20.25	15.05	16.55
June	1991	108.5	126.7	23.58	22.13	19.90	14.65	16.51
July	1991	108.2	126.8	24.70	22.33	19.93	14.56	16.36
Aug	1991	107.8	126.9	23.78	22.01	20.00	14.62	16.24
Sept	1991	107.6	126.7	24.23	22.27	20.38	14.89	16.47
Oct	1991	107.6	126.5	24.40	22.26	20.53	15.06	16.55
Nov	1991	107.5	127.0	24.58	22.44	20.79	14.85	16.62
Dec	1991	107.6	126.4	24.53 **R**	22.70 **R**	21.13 **R**	15.16 **R**	17.04 **R**
Jan	1992	107.7	127.0	24.80 **P**	22.70 **P**	21.21 **P**	15.54 **P**	16.96 **P**
Feb	1992	108.2	127.1	—.—	—.—	—.—	—.—	—.—

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1990 is found in Report 278.

[2] New Base Year of 1986 as of Report 266. Previous Base Year was 1981.

[3] New Base Year of 1986 as of Report 264. Previous Base Year was 1981.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1990 is found in Report 278.

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South Africa

		Average Declared Working Costs per Metric Ton of Gold Ore Milled[1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled[2] (March 1982 = 100)	Consumer Price Index[3] (1990 = 100)	Production Price Index All Groups[4] (1990 = 100)	Total Employment in Mining and Quarrying[5]	Total Salaries and Wages in Mining and Quarrying[5] (1,000 Rand)
							Annual Total[6]
1980	Avg.	35.50	—	25.5	27.8**R**	709,042	2,237,689
1981	Avg.	41.87	—	29.4	31.5**R**	722,918	2,756,928
1982	Avg.	47.23	103.9	33.7	35.9**R**	702,041	3,181,584
1983	Avg.	51.88	115.0	37.8	39.7**R**	700,901	3,563,282
1984	Avg.	58.95	130.3	42.2	43.0**R**	711,511	4,134,390
1985	Avg.	68.70	151.7	49.1	50.3**R**	724,587	4,778,612
1986	Avg.	80.18	177.9	58.2	60.1**R**	756,637	5,767,950
1987	Avg.	95.01	223.1	67.6	68.5**R**	751,864	6,911,395
1988	Avg.	106.69	241.1	76.2	77.5**R**	705,355	7,774,054
1989	Avg.	116.65	273.0	87.4	89.2**R**	700,360	8,833,934
1990	Avg.	129.37	305.3	100.0	100.0**R**	677,742	10,193,209
1991	Avg.	136.06	324.5	115.2	111.4**R**	—	—
							Monthly Total
Jan	1991	—	—	107.7	108.6**R**	648,944	935,839
Feb	1991	—	—	109.0	109.0**R**	650,948	893,373
Mar	1991	137.66	323.82	110.0	108.2**R**	651,843	924,930
Apr	1991	—	—	111.5	108.8**R**	639,939	887,722
May	1991	—	—	113.2	109.8**R**	630,481	887,107
June	1991	134.65	317.23	114.0	110.3**R**	640,908	890,595
July	1991	—	—	115.5	111.2**R**	637,581	881,182
Aug	1991	—	—	117.1	112.0**R**	633,699	963,710
Sept	1991	137.11	329.05	118.7	113.2**R**	639,535	1,014,424
Oct	1991	—	—	119.8	114.8**R**	580,942	853,933
Nov	1991	—	—	122.2	115.3**R**	—	—
Dec	1991	134.81	327.83	123.8	115.8**R**	—	—
Jan	1992	—	—	125.1	115.9	—	—
Feb	1992	—	—	126.2	—	—	—

P = Preliminary **R** = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in Report 278.

[2] Page 16 of Report 178 contains description and calculation of index.

[3] Central Statistical Service, Pretoria: All income groups-weighted average. Historical Data by month appears in Report 278.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa. Base Year changed from 1985 to 1990 in Report 284.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in Report 236.

[6] Annual total is shown, rather than monthly average, for indicated year.

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United States

		Producer Price Index [1]		Consumer Price Index [2] (1982-1984 = 100)	GNP Implicit Price Deflator [3] (1987 = 100)	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$) [4]			
		Industrial Commodities (1982 = 100)	All Commodities (1982 = 100)			Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
1980	Avg.	88.0	89.8	82.4	71.7 **R**	10.26	10.63	8.31	6.94
1981	Avg.	97.4	98.0	90.9	78.9 **R**	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	83.8 **R**	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	87.2 **R**	12.58	13.43	10.58	8.66
1984	Avg.	103.3	103.7	103.9	91.0 **R**	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	94.4 **R**	13.38	13.74	11.57	9.46
1986	Avg.	100.0	100.2	109.6	96.9 **R**	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	100.0 **R**	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	103.9 **R**	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	108.4 **R**	13.59	13.72	13.09	10.05
1990	Avg.	115.8	116.3	130.7	112.9 **R**	14.10	14.36	13.54	10.32
1991	Avg.	116.5	116.5	136.2	117.0	14.89	14.64	14.07	10.73
Jan	1991	119.3	119.0	134.6	—	14.73	14.63	13.85	10.60
Feb	1991	117.2	117.2	134.8	—	14.80	14.55	13.81	10.59
Mar	1991	115.6	116.1	135.0	115.9 **R**	14.93	14.55	13.85	10.55
Apr	1991	115.6	116.0	135.2	—	14.85	14.56	13.96	10.63
May	1991	116.1	116.5	135.6	—	14.79	14.52	14.01	10.66
June	1991	116.1	116.4	136.0	116.8 **R**	14.88	14.51	14.05	10.74
July	1991	116.0	116.1	136.2	—	15.09	14.56	14.16	10.77
Aug	1991	116.3	116.2	136.6	—	14.82	14.64	14.06	10.78
Sept	1991	116.3	116.1	137.2	117.4 **R**	15.04	14.59	14.21	10.84
Oct	1991	116.7 **R**	116.4	137.4	—	14.94	14.75	14.25	10.78
Nov	1991	116.7	116.4	137.8	—	15.29	14.89	14.27	10.88
Dec	1991	116.1	115.9	137.9	117.9	15.13 **R**	14.87	14.34 **R**	10.96
Jan	1992	115.6	115.6	138.1	—	15.09 **P**	14.74 **P**	14.28 **R**	10.90
Feb	1992	116.0	116.1	138.6	—	—	—	14.28 **P**	10.87 **P**

P = Preliminary **R** = Revised since last month

[1] US Bureau of Labor Statistics, Washington, DC: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents Historical data is presented in Report 278.

[2] US Bureau of Labor Statistics, Washington, DC: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in Report 278.

[3] US Department of Commerce, Washington, DC: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted. Historical data is presented in Report 278. Base Year change from 1982 to 1987 in Report 284.

[4] US Bureau of Labor Statistics, Washington, DC: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in Report 278.

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Volume and Price of Uranium Deliveries To The European Community[1]

— Compiled from data published by the Euratom Supply Agency —

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price		Spot Contracts[3] Average Price	
			in ECU per pound U_3O_8	in US Dollars per pound U_3O_8	in ECU per pound U_3O_8	in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19
1990	12,800	16.7	ECU 23.08	$29.39	ECU 7.60	$ 9.68

P = Preliminary **R** = Revised since last month

[1] The twelve European Community member nations are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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US Uranium Marketing Activities Statistics

— Compiled from data published by the US Energy Information Administration [1] —

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers [2] (million pounds U_3O_8)	Average Price of Delivered Uranium [2] (\$/lb. U_3O_8)	Quantity of Uranium Imported [3] (million pounds U_3O_8)	Average Price of Imported Uranium (\$/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	$16.10	3.6	n/a	1.2
1977	29.9	27.8	$19.75	5.6	n/a	4.0
1978	37.0	31.6	$21.60	5.2	n/a	6.8
1979	37.5	33.0	$23.85	3.0	n/a	6.2
1980	43.7	35.0	$28.15	3.6	$43.10	5.8
1981	38.5	32.6	$34.65	6.6	$32.90	4.4
1982	26.9	23.5	$38.37	17.1	$25.19	6.2
1983	21.2	24.2	$38.21	8.2	$26.16	3.3
1984	14.9	22.5	$32.65	12.5	$21.86	2.2
1985	11.3	21.7	$31.43	11.7	$20.08	5.3
1986	13.5	18.9	$30.01	13.5	$20.07	1.6
1987	13.0	20.8	$27.37	15.1	$19.14	1.0
1988	13.1	17.6	$26.15	15.8	$19.03	3.3
1989	13.8	18.4	$19.56	13.1	$16.75	2.1
1990	8.9	20.5	$15.70	23.7	$12.55	2.0

P = Preliminary   **R** = Revised since last month

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity*
1984-1990: Energy Information Administration, *Uranium Industry Annual*

[2] Data for 1976-1981 includes both domestic utilities and agents.

[3] Includes imports by domestic utilities and domestic suppliers.

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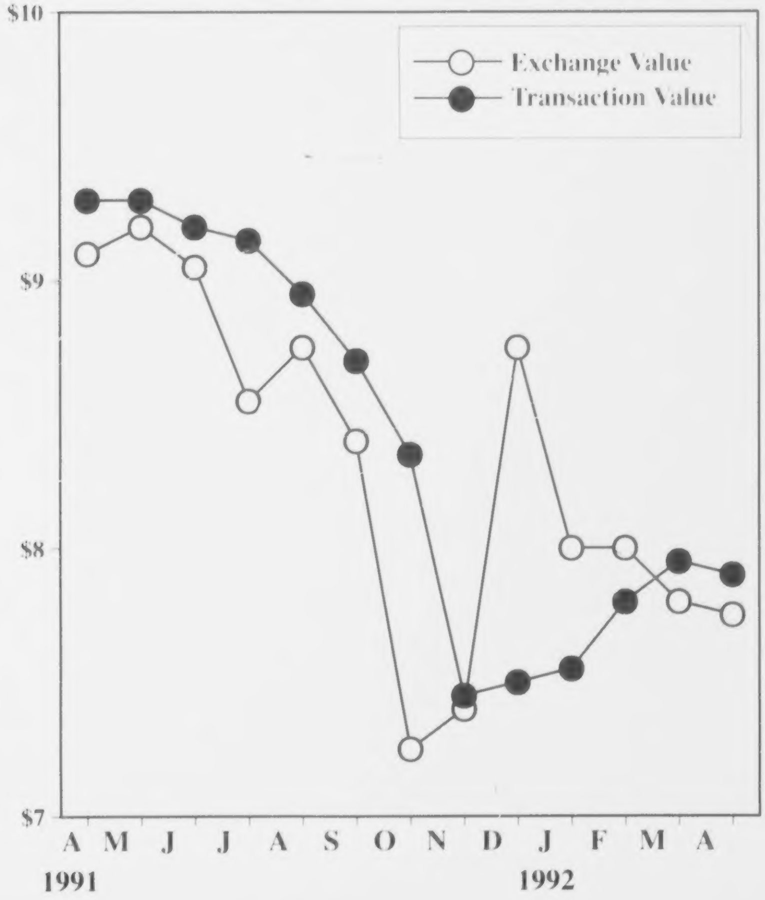

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- **Spain's Uranium Industry**

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- **India's Nuclear Program** 25

India made an early commitment to being as self-sufficient as possible in nuclear energy and has largely achieved that goal. The country currently operates eight reactors, has six reactors under construction, and twelve more reactors planned. It also operates complete fuel cycle facilities including uranium mines and mills, heavy water plants, fabrication and reprocessing facilities, and radioactive waste management facilities.

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To Our Readers

The 1991 Annual Review was mailed to our subscribers early this month. This special report summarizes 1991 nuclear fuel activities country-by-country, and analyzes developments in the spot and long-term uranium and enrichment markets.

* * *

We would like to draw your attention to the revised format for our tables that display the Market Values Expressed in Selected Currencies. We have added the countries of the People's Republic of China, the Czech and Slovak Federal Republic (CSFR), and Hungary. We also have revised the format to list all Market Values for a specific country on one page. We hope you find these changes result in a clearer and more concise presentation of the figures.

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MARKET REVIEW

Market Values Summary

NUEXCO Market Values	This Report April 30, 1992	Last Report March 31, 1992	12 Months Ago April 30, 1991
EXCHANGE VALUE[1]	**\$7.75** / lb equivalent U_3O_8	\$7.85	\$9.10
UF_6 VALUE[2]	**\$23.75** / kg U as UF_6	\$24.00	\$27.25
LOAN RATE[3]	**3.0 %** / annum	3.0%	3.5%
CONVERSION VALUE[4]	**\$1.60** / lb U as UF_6	\$1.60	\$1.45
SWU VALUE[5] **(0.3 w/o tails assay)**	**\$67** / SWU	\$69	\$52
TRANSACTION VALUE[6]	**\$7.90** / lb equivalent U_3O_8	\$7.95	\$9.30
Transactions	**22**	26	22
Months	**3**	3	3
Millions of Pounds	**6.2**	5.7	5.6

DEFINITIONS

[1] The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

[2] The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

[3] The **Loan Rate** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

[4] The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

[5] The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

[6] The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

- **a)** Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;
- **b)** At least ten transactions;
- **c)** Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US\$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.
- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.
- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight-percent (w/o) ^{235}U and a product assay of 3.0 weight-percent ^{235}U, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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APRIL MARKET REVIEW

(as of April 30, 1992)

OVERVIEW

The spot market price for uranium weakened further during April, and at month end, the NUEXCO Exchange Value had fallen \$0.10, to \$7.75 per pound U_3O_8. Only two near-term concentrates sales were reported, totalling less than 300 thousand pounds equivalent U_3O_8. One long-term sale was reported.

The UF_6 Value also declined, as increased competition among sellers led to a \$0.25 decrease, to \$23.75 per KgU as UF_6. Two near-term natural UF_6 transactions were reported involving 1.8 million pounds equivalent U_3O_8.

While seven uranium transactions totalling 3.9 million pounds equivalent U_3O_8 were reported, April market activity was actually quite low. Of the seven transactions, three relatively large natural and enriched UF_6 sales that had been in negotiation for several months were reported and accounted for the large majority of the month's reported sales volume.

Year-to-date spot and near-term sales volume now equals 10.4 million pounds equivalent U_3O_8 in 40 sales (**Table 1**). If this pace is maintained throughout the year, total sales volume will approximate that of 1991, and average purchase quantity will continue its trend of decreasing volume per transaction.

The Conversion Value was unchanged at \$1.60 per pound U as UF_6; three transactions totalling more than 1.4 million pounds U were reported. The Loan Rate also was unchanged, remaining at 3.0 percent per annum. No loans were reported during April.

Aggressive competition among suppliers forced the SWU Value down two dollars, to \$67 per SWU. Four enrichment transactions were reported: one involved a moderate quantity of SWU and occurred earlier in 1992; the other three sales involved enriched uranium product (EUP) equivalent to more than 500 thousand SWU and 1.8 million pounds equivalent U_3O_8 of feed.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	April 1992		Year-to-Date	
	No. of Sales	Volume [1]	No. of Sales	Volume [1]
Concentrates	2	0.3	25	5.1
Natural UF_6	2	1.8	7	2.7
EUP	3	1.8	8	2.6
Total [2]	**7**	**3.9**	**40**	**10.4**

[1] Million pounds equivalent U_3O_8
[2] Due to independent rounding, columns may not equal total.

Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply [1]	Active Demand [1]
• Uranium (thousand lbs equivalent U_3O_8)	5,135	710
• Supply/Demand Ratio:	7.2	
• Loan (thousand lbs equivalent U_3O_8)	6,170	2,000
• Conversion (thousand lbs U as UF_6)	4,185	2,115
• SWU (thousand SWUs)	780	85

[1] Supply and Demand tables in the Market Review section of this Report provide details for each category.

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NATURAL URANIUM AND CONVERSION

Spot market prices for uranium concentrates continued a slow decline in April, and the NUEXCO **Exchange Value** ended the month at **$7.75** per pound U_3O_8, down $0.10 from the end of March. Market activity slowed during the month as demand remained quite low. Both buyers and sellers have remained cautious during the on-going anti-dumping investigation against the former Soviet Union. Activity is likely to remain slow, at least until the International Trade Administration of the Department of Commerce releases its preliminary determination in the case on May 18.

Only two near-term concentrates sales were reported in April: buyers purchased a total of almost 300 thousand pounds equivalent U_3O_8 from intermediaries at prices related to published spot market indicators.

* * *

The **UF_6 Value** also declined in April, falling $0.25, to **$23.75** per kgU as UF_6. Limited sales opportunities resulted in increased competition among sellers, and led to downward pressure on the UF_6 market. Competition has been even more intense for UF_6 sales that call for delivery in late 1992 or early 1993, as some sellers may have increased supply availability during that period.

Two natural UF_6 transactions were reported: a US utility and intermediary purchased a total exceeding 1.8 million pounds equivalent U_3O_8 for delivery later this year.

* * *

One transaction is reported in the **long-term uranium market**. A utility purchased more than five million pounds equivalent U_3O_8 for delivery during the period 1992-1995.

* * *

The **Transaction Value** declined $0.05, to **$7.90** per pound U_3O_8, reversing four consecutive months of increasing Transaction Values. The April 30 Value was based on 22 transactions over three months involving 6.2 million pounds equivalent U_3O_8.

* * *

Active uranium supply declined by more than two million pounds (31 percent), falling to **5.1 million** pounds equivalent U_3O_8 at month end. However, relative to supply, **active uranium demand** fell even further. It decreased 35 percent,

Table 3
ENRICHMENT PRICES
(April 30, 1992)

Prices	This Month Report 285	Last Month Report 284	12 Months Ago Report 273
NUEXCO SWU Value ($US per SWU)	67	69	52
US DOE SWU prices: ($US per SWU)			
USC	121.50[1]	121.50[1]	117.85[2]
AFC	153.00[3]	153.00[3]	153.00[3]
Requirements	157.00[3]	157.00[3]	157.00[3]
Incentive Price (IP2)	104.67[4]	104.67[4]	100.68[5]
Calculated worth of enriched UF_6[6]: ($US per KgU as UF_6)			
2.0 w/o ^{235}U	212	217	200
2.5 w/o ^{235}U	297	304	276
3.0 w/o ^{235}U	386	394	355
3.5 w/o ^{235}U	476	487	436
4.0 w/o ^{235}U	568	580	517
4.5 w/o ^{235}U	660	676	600

[1] Effective 10/1/91.
[2] Effective 10/1/89 to 9/30/91.
[3] Effective since 10/1/84.
[4] Provisional IP2 for FY92: Effective 10/1/91 to 9/30/92, for up to 30% of annual requirements.
[5] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.
[6] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 w/o ^{235}U tails assay.

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to **710 thousand** pounds equivalent U_3O_8, as few discretionary buyers have sought material during the anti-dumping investigation. As a result, the **supply/demand ratio** increased to **7.2**.

* * *

The **Loan Rate** remained unchanged at **3.0** percent per annum. No loans were reported during April.

* * *

The **Conversion Value** also was unchanged, remaining at **$1.60** per pound U as UF_6. A dichotomy between the European and North American conversion markets continues to exist, as more demand and somewhat tighter supply have increased prices in Europe. In the USA, excess conversion capacity has caused suppliers to price more aggressively. With the April restart of Sequoyah Fuels' Gore, Oklahoma plant, this overcapacity situation in the USA is likely to continue in the near term.

Three near-term conversion transactions were reported during April. Intermediaries purchased 1.4 million pounds of conversion services for 1992 delivery.

ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

The April 30, 1992, **SWU Value** dropped two dollars, to **$67** per SWU, as several suppliers competed aggressively for limited sales opportunities. One near-term enrichment transaction was reported for a moderate quantity of SWU, although it occurred earlier in 1992. In addition, three April transactions involving EUP were reported. The buyers consisted of a utility and two intermediaries, who purchased material containing a total of 1.8 million pounds equivalent U_3O_8 of feed and more than 500 thousand SWU.

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RECENT TRANSACTIONS

Uranium Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5411	1992	101-300	98-102	Producer	Intermediary	
5412	1992	301-600	98-102	Utility	**R**	UF_6
5413	1992	101-300	98-102	Utility	Intermediary	
5417	1992-1995	3,001-6,000	**R**	Utility	Intermediary	
5418A	1992	101-301	See Remarks	Utility	Utility	Contained in EUP
5419	1992	1,001-3,000	103-110	Intermediary	Producer	UF_6
5423A	1992	601-1,000	See Remarks	Intermediary	**R**	Contained in EUP
5424A	1993	601-1,000	See Remarks	**R**	**R**	Contained in EUP

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Exchange Value or UF6 Value. The endpoints of each range are included within that range.

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MARKET REVIEW

RECENT TRANSACTIONS

Natural Uranium Loans[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Loan Rate	Borrower	Lender	Remarks
No Natural Uranium Loans are reported						

Conversion Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range[2] of Current Conversion Value	Buyer	Seller	Remarks
5420	1992	1,001-3,000	98-102	Intermediary	Converter	
5421	1992	301-600	98-102	Intermediary	Intermediary	
5422	1992	Less Than 50	**R**	Intermediary	Converter	

Enrichment Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity[3] (thousand SWU)	Price Within Percentage Range[2] of Current SWU Value[4]	Buyer	Seller	Remarks
5414	1992	301-600	**R**	Utility	Utility	Occurred earlier in 1992
5418B	1992	Less Than 50	See Remarks	Utility	Utility	Contained in EUP
5423B	1992	101-300	See Remarks	Intermediary	**R**	Contained in EUP
5424B	1993	101-300	See Remarks	**R**	**R**	Contained in EUP

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., **X** dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

Uranium Supply

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1505	500	—	1992	
91-1506	750	—	1992	U_3O_8/UF_6
91-1507	500	—	1992	
91-1511	1,300	—	1992	UF_6/UF_6e
91-1512	785	—	1992	UF_6
92-1119*	155	—	1992	
92-1501A	645	—	1992	UF_6e
92-1509	500	—	1992	UF_6
91-1268	—	600 per year	1992-1999	
TOTAL	**5,135**			
INACTIVE	**2,800**			
AVAILABLE TO LOAN:				
ACTIVE				
92-1008	500	—	—	UF_6
92-1072*	1,600	—	—	UF_6
92-1074	1,000	—	—	
92-1075	500	—	—	
92-1077	180	—	—	UF_6
92-1114*	390	—	—	UF_6
92-1503	2,000	—	—	
TOTAL	**6,170**			
INACTIVE	**2,600**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 92-1017, 92-1076, 92-1087

Active Projects removed since last month: 91-1084, 92-1060

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SUPPLY AND DEMAND

Uranium Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Quantity (Thousand Pounds equivalent U_3O_8) Intermediate or Long-term[2]	Delivery Period	Remarks
INQUIRIES TO PURCHASE:				
ACTIVE				
92-1110*	360	—	1992	
92-1113*	250	—	1992	UF_6
92-1120*	100	—	1992	
91-1184	—	350 per year	1993-1997	
91-1290	—	310 per year	1995-1999	U_3O_8/UF_6
91-1294	—	250 per year	1996-2000	
92-1015	—	1,300 per year	1995-2004	
92-1032	—	200 per year	1996-1998	U_3O_8/UF_6
92-1064	—	100 per year	1993-1996	U_3O_8/UF_6
91-1197	—	2,210	1992-1997	U_3O_8/UF_6
91-1267	—	350	1993	UF_6
91-1283	—	5,225	1994-2000	U_3O_8/UF_6
TOTAL	**710**			
INACTIVE	**1,740**			
INQUIRIES TO BORROW:				
ACTIVE				
92-1505	500	—	—	
92-1511*	1,500	—	—	
TOTAL	**2,000**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 91-1118, 92-1098

Active Projects removed since last month: 91-1227A, 92-1030, 92-1073, 92-1091, 92-1117

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SUPPLY AND DEMAND

Conversion Supply and Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF$_6$) Within 3 Years[1]	Beyond 3 Years[1]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1500	440	—	1992	
91-1501*	1,100	—	1992	
92-1111*	1,545	—	1993	
92-1507	1,100	—	1992	
TOTAL	**4,185**			
INACTIVE	*None reported*			
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1275	620	—	1992	
92-1068*	65	—	1992	
92-1107*	330	—	1993	
92-1508	1,100	—	1992	
TOTAL	**2,115**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: 92-1506, 92-1510

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SUPPLY AND DEMAND

SWU Supply and Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1509	200	—	1992	
91-1515	200	—	1992	
92-1124*	250	—	1992	
92-1501B	130	—	1992	UF$_6$e
TOTAL	**780**			
INACTIVE	*None reported*			
INQUIRIES TO PURCHASE:				
ACTIVE				
92-1058*	10	—	1992	
92-1079	35	—	1992	
92-1096B*	40	—	1993	UF$_6$e
90-1196	—	60 per year	1995 on	
91-1142	—	75 per year	1995-2000	
92-1016	—	170 per year	1996-2006	
91-1152	—	2,700	1995-2001	
91-1171	—	560	1995-1998	
91-1250	—	45	1993	UF$_6$e
92-1024	—	12	1993	
TOTAL	**85**			
INACTIVE	**280**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: 91-1227B

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES[1]

Australia *to* Hungary	Australia (dollar)	Belgium (franc)	Canada (dollar)	China (renminbi)	CSFR (koruna)	EC (ecu)	Finland (markka)	France (franc)	Germany (mark)	Hungary (forint)
EXCHANGE VALUE										
per pound equivalent U_3O_8 as Concentrates										
This Month (Apr 30, 1992)	**10.23**	**262.98**	**9.24**	**42.77**	**219.94**	**6.23**	**34.75**	**43.11**	**12.78**	**610.16**
Last Month (Mar 31, 1992)	10.19	265.65	9.34	42.92	223.02	6.32	35.21	43.75	12.90	616.15
12 Months Ago (Apr 30, 1991)	11.64	319.07	10.49	48.09	—.—	7.65	36.30	52.52	15.55	—.—
per kg U as Concentrates										
This Month (Apr 30, 1992)	**26.61**	**683.69**	**24.02**	**111.20**	**571.81**	**16.20**	**90.36**	**112.08**	**33.23**	**1,586**
Last Month (Mar 31, 1992)	26.50	690.63	24.27	111.58	579.80	16.42	91.53	113.73	33.54	1,602
12 Months Ago (Apr 30, 1991)	30.25	829.52	27.28	125.02	—.—	19.89	94.36	136.54	40.42	—.—
UF_6 VALUE										
per kg U as UF_6										
This Month (Apr 30, 1992)	**31.36**	**805.90**	**28.32**	**131.08**	**674.02**	**19.09**	**106.51**	**132.12**	**39.17**	**1,870**
Last Month (Mar 31, 1992)	31.17	812.18	28.54	131.22	681.84	19.31	107.64	133.75	39.44	1,884
12 Months Ago (Apr 30, 1991)	34.85	955.47	31.42	144.01	—.—	22.91	108.69	157.27	46.56	—.—
TRANSACTION VALUE										
per pound equivalent U_3O_8 as Concentrates										
This Month (Apr 30, 1992)	**10.43**	**268.07**	**9.42**	**43.60**	**224.20**	**6.35**	**35.43**	**43.95**	**13.03**	**621.97**
Last Month (Mar 31, 1992)	10.32	269.04	9.45	43.47	225.86	6.40	35.66	44.30	13.06	623.99
12 Months Ago (Apr 30, 1991)	11.89	326.09	10.72	49.15	—.—	7.82	37.09	53.67	15.89	—.—
per kg U as Concentrates										
This Month (Apr 30, 1992)	**27.12**	**696.92**	**24.49**	**113.35**	**582.88**	**16.51**	**92.10**	**114.25**	**33.87**	**1,617**
Last Month (Mar 31, 1992)	26.84	699.43	24.58	113.00	587.18	16.63	92.70	115.18	33.97	1,622
12 Months Ago (Apr 30, 1991)	30.92	847.75	27.88	127.77	—.—	20.32	96.43	139.54	41.31	—.—
CONVERSION VALUE										
per pound U as UF_6										
This Month (Apr 30, 1992)	**2.11**	**54.29**	**1.91**	**8.83**	**45.41**	**1.29**	**7.18**	**8.90**	**2.64**	**125.97**
Last Month (Mar 31, 1992)	2.08	54.15	1.90	8.75	45.46	1.29	7.18	8.92	2.63	125.58
12 Months Ago (Apr 30, 1991)	1.85	50.84	1.67	7.66	—.—	1.22	5.78	8.37	2.48	—.—
per kg U as UF_6										
This Month (Apr 30, 1992)	**4.66**	**119.69**	**4.21**	**19.47**	**100.11**	**2.84**	**15.82**	**19.62**	**5.82**	**277.71**
Last Month (Mar 31, 1992)	4.58	119.37	4.19	19.29	100.21	2.84	15.82	19.66	5.80	276.86
12 Months Ago (Apr 30, 1991)	4.09	112.09	3.69	16.89	—.—	2.69	12.75	18.45	5.46	—.—
SWU VALUE										
per SWU at 0.30% ^{235}U Tails Assay										
This Month (Apr 30, 1992)	**88.47**	**2,274**	**79.89**	**369.77**	**1,901**	**53.85**	**300.46**	**372.72**	**110.49**	**5,275**
Last Month (Mar 31, 1992)	89.61	2,335	82.05	377.26	1,960	55.51	309.46	384.53	113.39	5,416
12 Months Ago (Apr 30, 1991)	66.50	1,823	59.96	274.80	—.—	43.71	207.40	300.11	88.84	—.—

[1] Calculated using currency exchange rates **for** the last business day of the month, as published in *The Wall Street Journal*.

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES[1]

Italy *to* **United States**	**Italy** (lira)	**Japan** (yen)	**Netherlands** (guilder)	**S. Africa** (comm. rand)	**S. Korea** (won)	**Spain** (peseta)	**Sweden** (krona)	**Switzerland** (franc)	**Taiwan** (dollar)	**UK** (pound)	**USA** (dollar)
EXCHANGE VALUE											
per pound equivalent U_3O_8 as Concentrates											
This Month (Apr 30, 1992)	**9,607**	**1,033**	**14.38**	**22.28**	**6,159**	**801.70**	**46.13**	**11.72**	**193.35**	**4.36**	**7.75**
Last Month (Mar 31, 1992)	9,727	1,042	14.53	22.56	6,082	815.50	46.84	11.77	198.02	4.52	7.85
12 Months Ago (Apr 30, 1991)	11,480	1,239	17.49	25.36	6,604	957.29	55.73	13.13	244.79	5.26	9.10
per kg U as Concentrates											
This Month (Apr 30, 1992)	**24,976**	**2,685**	**37.37**	**57.93**	**16,011**	**2,084**	**119.93**	**30.46**	**502.66**	**11.34**	**20.15**
Last Month (Mar 31, 1992)	25,289	2,709	37.77	58.66	15,812	2,120	121.77	30.60	514.80	11.76	20.41
12 Months Ago (Apr 30, 1991)	29,845	3,222	45.46	65.92	17,170	2,489	144.87	34.13	636.39	13.67	23.66
UF_6 VALUE											
per kg U as UF_6											
This Month (Apr 30, 1992)	**29,441**	**3,165**	**44.05**	**68.29**	**18,873**	**2,457**	**141.37**	**35.91**	**592.52**	**13.37**	**23.75**
Last Month (Mar 31, 1992)	29,740	3,186	44.41	68.99	18,595	2,493	143.20	35.99	605.40	13.82	24.00
12 Months Ago (Apr 30, 1991)	34,376	3,712	52.36	75.93	19,776	2,867	166.87	39.31	733.02	15.74	27.25
TRANSACTION VALUE											
per pound equivalent U_3O_8 as Concentrates											
This Month (Apr 30, 1992)	**9,793**	**1,053**	**14.65**	**22.71**	**6,278**	**817.21**	**47.02**	**11.94**	**197.09**	**4.45**	**7.90**
Last Month (Mar 31, 1992)	9,851	1,055	14.71	22.85	6,159	825.89	47.43	11.92	200.54	4.58	7.95
12 Months Ago (Apr 30, 1991)	11,732	1,267	17.87	25.91	6,749	978.33	56.95	13.42	250.17	5.37	9.30
per kg U as Concentrates											
This Month (Apr 30, 1992)	**25,460**	**2,737**	**38.10**	**59.05**	**16,321**	**2,125**	**122.25**	**31.05**	**512.39**	**11.56**	**20.54**
Last Month (Mar 31, 1992)	25,611	2,744	38.25	59.41	16,013	2,147	123.32	30.99	521.36	11.91	20.67
12 Months Ago (Apr 30, 1991)	30,501	3,293	46.46	67.37	17,547	2,543	148.06	34.88	650.38	13.97	24.18
CONVERSION VALUE											
per pound U as UF_6											
This Month (Apr 30, 1992)	**1,983**	**213.19**	**2.97**	**4.60**	**1,271**	**165.51**	**9.52**	**2.42**	**39.92**	**0.90**	**1.60**
Last Month (Mar 31, 1992)	1,983	212.40	2.96	4.60	1,239	166.22	9.55	2.40	40.36	0.92	1.60
12 Months Ago (Apr 30, 1991)	1,829	197.49	2.79	4.04	1,052	152.54	8.88	2.09	39.00	0.84	1.45
per kg U as UF_6											
This Month (Apr 30, 1992)	**4,373**	**470.01**	**6.54**	**10.14**	**2,803**	**364.89**	**21.00**	**5.33**	**88.00**	**1.99**	**3.53**
Last Month (Mar 31, 1992)	4,371	468.26	6.53	10.14	2,733	366.44	21.05	5.29	88.98	2.03	3.53
12 Months Ago (Apr 30, 1991)	4,033	435.40	6.14	8.91	2,320	336.28	19.58	4.61	85.99	1.85	3.20
SWU VALUE											
per SWU at 0.30 w/o ^{235}U Tails Assay											
This Month (Apr 30, 1992)	**83,054**	**8,927**	**124.28**	**192.64**	**53,242**	**6,931**	**398.81**	**101.30**	**1,672**	**37.72**	**67.00**
Last Month (Mar 31, 1992)	85,502	9,160	127.68	198.33	53,459	7,168	411.69	103.46	1,741	39.75	69.00
12 Months Ago (Apr 30, 1991)	65,599	7,083	99.92	144.89	37,739	5,470	318.43	75.01	1,399	30.04	52.00

[1] Calculated using currency exchange rates for the last business day of the month, as published in *The Wall Street Journal*.

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WASHINGTON FOCUS

by Linda L. Gunter

The House of Representatives is gearing up to pass energy legislation possibly in June. The key committees have all considered versions of the House energy bill, and activity has moved behind closed doors as the committee chairmen meet to work out compromises on issues in their jurisdiction. Currently, sources indicate the Rules Committee may meet the week of May 18 to shape a final bill for consideration on the House floor.

House National Energy Bill HR 776

◇ On April 28, the House Ways & Means committee held a hearing on certain provisions of the National Energy bill (HR 776) and its tax implications. Included in the committee's jurisdiction was the mechanism for funding the decommissioning and decontamination (D&D) of the gaseous diffusion plants (GDP) by means of a retroactive assessment on US utility customers. Representatives of the Department of Energy (DOE) and the Treasury Department, as well as several witnesses from the utility industry and the National Taxpayers Union, testified at the hearing.

The administration did not present a unified opinion on the D&D fund. The Treasury's spokesman testified that the funding mechanism in HR 776 is similar to DOE's budget request of 0.33 mill per kilowatt-hour and therefore consistent with the administration's intent to fund D&D. However, DOE's representative testified that HR 776 creates an unfair burden on US utility customers. DOE has acknowledged in the past that the US government (i.e. the military) and foreign utility customers have some financial obligation. In his testimony, the DOE spokesperson stated that since the total amount of money necessary to do the cleanup is not yet known, it is premature to legislate a specific revenue requirement from the utilities. He added that DOE's internal financial analysis of the bill shows the new corporation should make $140 million in revenue the first year, leaving $360 million to be paid by the utilities.

In questioning the administration witnesses, several Congressman noted that the bill's funding provision creates an unfair tax on nuclear utility ratepayers, and Chairman Rostenkowski noted that this fee will be passed on to consumers through higher rates. Several committee members asked DOE about the agreement to share costs between the Department of Defense and commercial customers. DOE has not issued its policy statement, but the representative stated that contractor reports on the total cost of D&D support a 50-50 cost sharing. This statement is questionable however, in view of a Martin Marietta report indicating that 90 percent of the contamination is attributable to the Department of Defense. Rep. Nancy Johnson (R-CT) asked if the 50-50 allocation is based on the amount of uranium used in the enrichment process or the level of enrichment. The DOE spokesperson responded that the allocation is based on the uranium used. Johnson then replied that DOE should look at the pollution caused by the level of enrichment.

The utility witness panel, which included representatives of Commonwealth Edison, Philadelphia Electric, and Southern California Edison, said the utilities are willing to pay a share, but do not feel they should bear the entire burden. They asked the committee to consider capping the utilities' liability at $2.5 billion or 15 years, whichever comes first. The utility representatives also said the

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uranium mill tailings cleanup should be funded from another source, not the GDP D&D fund, since mill tailings are a government, not a ratepayer, responsibility.

The National Taxpayer's Union (NTU) urged the Committee to support HR 776, since NTU perceives that the bill will protect the taxpayer from the D&D liability. NTU claimed the $500 million revenue to be achieved by the corporation would be a taxpayer contribution. It added, however, that if the corporation is unsuccessful in making a $500 million profit, the utilities should be responsible for supplying the difference. If the utilities were successful in having their liability capped at $2.5 billion, then NTU will demand an $11 billion payment from the corporation to pay "unrecovered government costs".

The Ways & Means Committee marked up the bill on April 29 and 30. The utilities were successful in having their liability capped at $2.5 billion or 15 years. Individual utilities will be responsible for any shortfall from the $500 million profit, their portion to be determined on the basis of past SWU purchases. The mill tailings funding was removed from the D&D fund. Rep. Robert T. Matsui (D-CA) offered an amendment to give a tax credit to solar and wind producers, which was adopted. This amendment, in order to be revenue neutral, necessitated the removal of a resource depletion allowance for uranium mining. The Committee adopted its energy bill by voice vote.

Republics File For Injunction in International Court

◇ Judge Jane Restani of the Court of International Trade held a hearing on May 4 to consider whether the republics of Tajikistan and Ukraine, and the companies of Techsnabexport, NUEXCO, and Global Nuclear Services and Supply Ltd. were entitled to a preliminary injunction against the Department of Commerce (DOC). DOC has announced its intention to continue the anti-dumping proceeding against the independent republics, even though the petition was filed against the Soviet Union. At the hearing, a lawyer representing the Russian Federation asked to join the case, in support of the republics and the other plantiffs. The judge left the record open until May 11 to enable parties to respond to Russia's motion to intervene.

The judge heard arguments regarding the anti-dumping law, specifically whether it permits DOC to continue the investigation against the former Soviet Union and to apply the results to the newly independent republics. The hearing also addressed the questions of whether the court has jurisdiction over the case, and whether there has been any irreparable injury to the republics. The republics and the companies contend that the Commerce Department's April decision to continue the case has no basis in law because the Soviet Union no longer exists. Since DOC has now indicated its intention to pursue this action against the individual republics, the republics believe the court has the authority to issue the order granting a temporary injunction against DOC. The republics claim they received no timely notice that the dumping case was applicable to them, and thus have been denied the right to participate in the case from the beginning, putting them at a severe disadvantage. One issue in the case also revolves around the question of whether the republics are being treated fairly by the non-market country analysis applied to communist countries, as the Republics are adopting market-economy principles. Since Congress never anticipated that a country would cease to exist when it enacted the anti-dumping law, the Commerce Department is faced with unique issues in dealing with this case. The Court likely will issue its decision prior to the May 18 deadline for DOC's preliminary determination on the dumping investigation.

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INDUSTRY BRIEFS

Cogema and CEA Obtain Greater Autonomy in Foreign Investments

The government of France has granted Cogema and CEA-Industrie greater autonomy in their foreign investments. The government removed the requirement in which the companies had to obtain approval from the minister of economic affairs and other ministers with interests in the area prior to making the investment.

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Sweden's Sydkraft Buys Competitor Baakab

Sydkraft, Sweden's second largest power producer, has concluded an agreement whereby it will purchase another Swedish power producer, Baakab AB. The 10.6 billion krona (US$1.75 billion) purchase will increase Sydkraft's electrical production by over 25 percent, to 29 Terrawatt-hours. Baakab generates its power primarily from hydroelectric or fossil-fueled stations, but Baakab does have a five-percent interest in the Oskarshamn nuclear power station. This portion, added to its previous ownership, gives new-owner Sydkraft a total interest of 53 percent in the Oskarshamn plant.

The acquisition is one of several recent consolidations in the Swedish power industry, as the country prepares for Europe's restructured and more open electricity market.

NRC Clears Sequoyah Fuels to Restart Oklahoma Plant

On April 14, the US Nuclear Regulatory Commission (NRC) gave its approval to Sequoyah Fuels Corporation to restart operations at its Gore, Oklahoma plant. The plant had been shutdown by the NRC on October 3, 1991.

The NRC approved a staged restart, as proposed by Sequoyah in an April 1 meeting with the Commission. The NRC has had inspectors on-site 24 hours a day, and must approve each stage of the restart operations. The first stage commenced on April 16 and resumed the plant's depleted UF_4 operations. However on May 1, a pipeline gasket failed in the UF_4 production building and led to a small release of uranium. The event was not serious and the building was decontaminated soon after the incident.

The first phase of the restart of the UF_6 facility—the warm up of some key components on the main UF_6 line—began near the end of April and was not affected by the UF_4 incident. Nevertheless, the complete restart of the entire plant likely will be delayed at least a week until the root cause of the UF_4 incident is identified.

Sequoyah's license for operating the plant expired in September 1991, but as it has submitted to the NRC an application for a 10-year renewal of its license, Sequoyah is allowed to continue operating the plant during the renewal review period.

NRG Pulls Back From Nuclear Fuel Market

During April, NRG Group, a subsidiary of Northern States Power Company (NSP), stated it will discontinue brokering nuclear fuels to focus on more profitable projects. NRG's only remaining involvement in the nuclear fuel market will be through Graystone Corporation, another NSP subsidiary, that is a joint-venture partner in Louisiana Energy Services. NRG's statement did not preclude it from returning to the nuclear fuel market at a later date, but at present, the fossil-fuel and waste-as-fuel activities of the company are more profitable.

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FPL's St. Lucie 2 Breaks LWR Record

On April 21, the St. Lucie 2 839-MWe pressurized water reactor, owned and operated by Florida Power & Light Company (FPL), set the light water reactor record for continuous operation at 502 days, stopping at that point for a planned shutdown. The record previously was held by the Wolf Creek plant, which set a record of 487 days in September 1991.

The United Kingdom's Oldbury 1, a 217-MWe Magnox reactor owned and operated by Nuclear Electric, holds the record for all types of commercial reactors at 713 days. However, it has a distinct advantage over LWRs in that it does not need to be shut down for refueling.

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SPAIN'S URANIUM INDUSTRY

This article is part two of a report focusing on Spain's nuclear power industry and its uranium program. In last month's issue (April 1992 Monthly Report, No. 284), part one described the country's nuclear power program. This portion will detail Spain's uranium industry and the expansion plans for the Saelices el Chico uranium production project located in Salamanca province.

INTRODUCTION

Spain currently operates nine nuclear reactors totalling over 7,100 MWe of capacity, contributing about one-third of all electricity generated in Spain. Four reactors at advanced stages of construction remain mothballed as the result of a government-imposed moratorium, and a fire at Vandellos I in 1989 led to its premature closure and to a revival of anti-nuclear sentiment in the country.

In the new national energy plan, which was sent to the Spanish Parliament on July 25, 1991, Spain opted to continue the nuclear moratorium that began in 1984 and rely upon conservation measures, additional natural gas imports, and electricity imports to meet expected demand. Under the new plan, nuclear power's share of Spain's total installed electrical generating capacity will fall from about 17 percent in 1990, to approximately 14 percent by the end of the century, as only the current nuclear facilities will continue to operate and no new nuclear plants will be built. Spain's integration into the European Community also is affecting the country's energy plans, prompting consolidation within the Spanish electricity sector in order to be more competitive in Europe. To supply the existing reactors, the government is supporting a major expansion of the country's domestic uranium industry.

URANIUM INDUSTRY

Spain's nuclear program is under the supervision of the Ministry of Industry and Energy (MIE). The functionary agencies within the MIE include the state-owned Centro de Investigacion Energética, Medioambiental y Technología (CIEMAT) [formerly the Junta de Energía Nuclear (JEN)], and Empresa Nacional del Uranio S.A. (ENUSA). JEN was formed in the 1950s for the purpose of prospecting and exploring for uranium within Spain. ENUSA was originally created to exploit the uranium ore deposits in Spain discovered by JEN, but after the oil crisis in 1973, ENUSA's mission was extended to include the development of all nuclear fuel cycle activities. ENUSA is owned by the state-owned holding company Instituto Nacional de Industria (60 percent) and by CIEMAT (40 percent). ENUSA's responsibilities encompass uranium exploration, mining and milling, conversion, enrichment, and fuel fabrication. The company also is responsible for procuring fuel for all operating Spanish reactors.

Exploration for uranium resources in Spain began in the 1950s. JEN began regional reconnaissance operations of the sediments of the interior regions, and the igneous and metamorphic rocks of the mountainous areas. Approximately 40 prospective radiometric anomalies and mineral occurrences were located, and JEN selected the most favorable for further appraisal, including uranium deposits in the province of Salamanca.

RESERVES

Continuing uranium exploration efforts in the Salamanca province of west-central Spain have steadily increased the amount of known reserves, and by the end of 1990, over 79 million pounds U_3O_8 had been identified. About 80 percent of these reserves have been identified at a distance of less than 20 km from Planta Elefante, a heap leaching plant located near the village of Saelices el Chico. As radiometric, emanometric, and geochemical studies have indicated numerous anomalies, it is likely that estimates of uranium reserves will continue to increase.

In 1976, ENUSA decided to continue uranium exploration and research, and in 1981, was given the power to execute the National Uranium Exploration and Investigation Plan (Plan Nacional de Exploración e Investigación de Uranio - PNEIU), initiated by JEN in 1975. The activities of PNEIU were terminated in 1984. In 1986, the Department of Exploration (Departamento de Exploración) was created, with the primary objective of finding as many

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more reserves as those that were currently being exploited, as well as to complete the studies of all of the zones and anomalies in Salamanca province that had been identified before the activities of PNEIU were terminated. **Figure 1** shows the growth of identified Spanish reserves from 1976 through 1990.

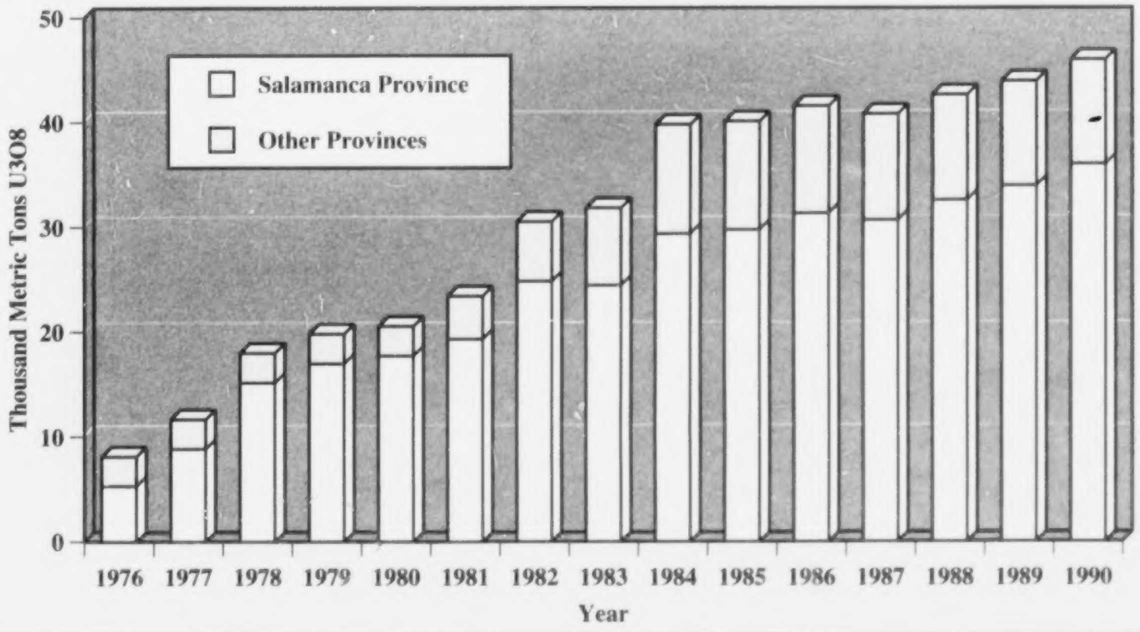
PRODUCTION

Spain's first full-scale industrial uranium production center started in 1959 at the General Hernandez Vidal uranium plant at Andujar, near the city of Jaén. The conventional processing plant had a capacity of about 440 thousand pounds of ore per day, and the total output equalled about 130 thousand pounds equivalent U_3O_8 annually. The plant was designed, constructed, and operated by JEN to process ore discovered in southern Spain in the Santuario de la Virgen de la Cabeza area, also close to Jaén, and at Cardena, near the city of Cordoba. Due to exhaustion of deposits, the plant was shut down in 1981.

Uranium mineralization was discovered in the vicinity of Saelices el Chico, in the province of Salamanca, during the early 1960s. In the late 1960s, JEN began testing ore from these deposits at a heap leaching pilot plant, and designed a commercial plant based on the results. ENUSA began the exploitation of the FE deposit at Saelices el Chico in July 1974. The Planta Elefante heap leaching plant was built near the main deposit, and brought into operation by ENUSA in May 1975. An expansion program, known as the Quercus project, is underway at the site, with a new processing plant due to start up in 1993.

None of ENUSA's deposits in the Salamanca province are amenable to underground exploitation because of the erratic geometry of the mineralization, but because of the FE deposit's shallowness, it is being exploited as an open pit (**Figure 2**). However, the deposit requires the exploitation of short benches (6 meters), which improves selectivity, but increases the cost of production.

Figure 1
SPAIN'S IDENTIFIED URANIUM RESERVES – 1976-1990



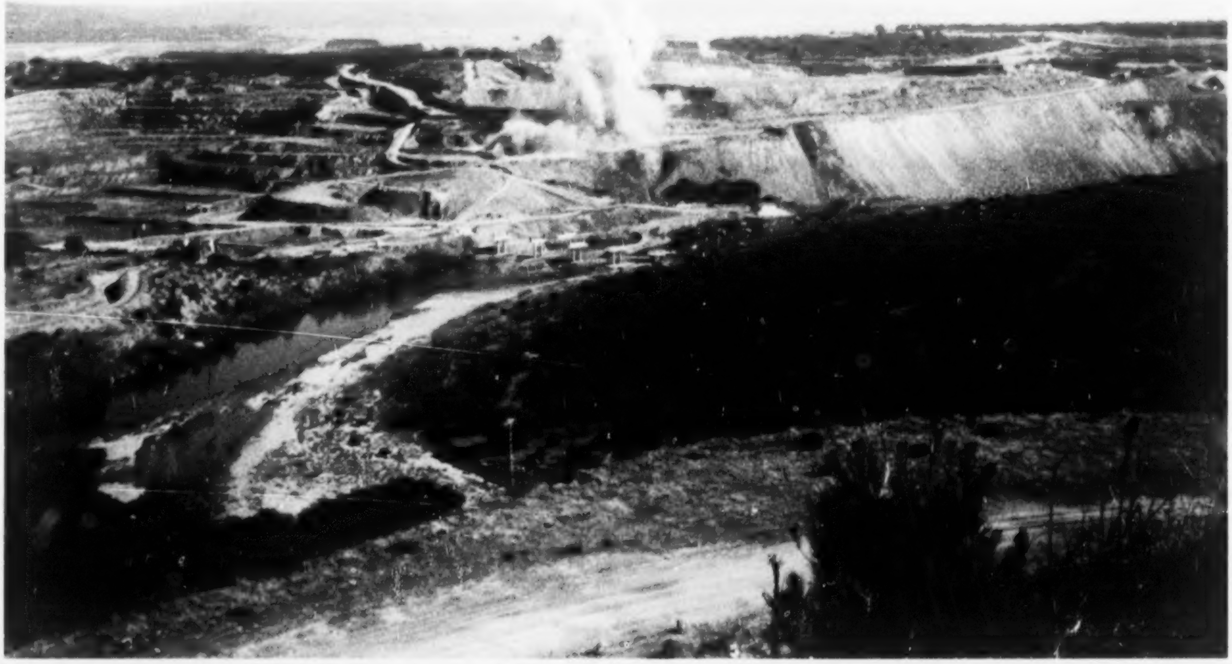


Figure 2 — Open-Pit Mine at the Saelices el Chico Uranium Project. A photograph over the Agueda River, just following dynamite blasting at the FE deposit. (*Photo courtesy of ENUSA*)

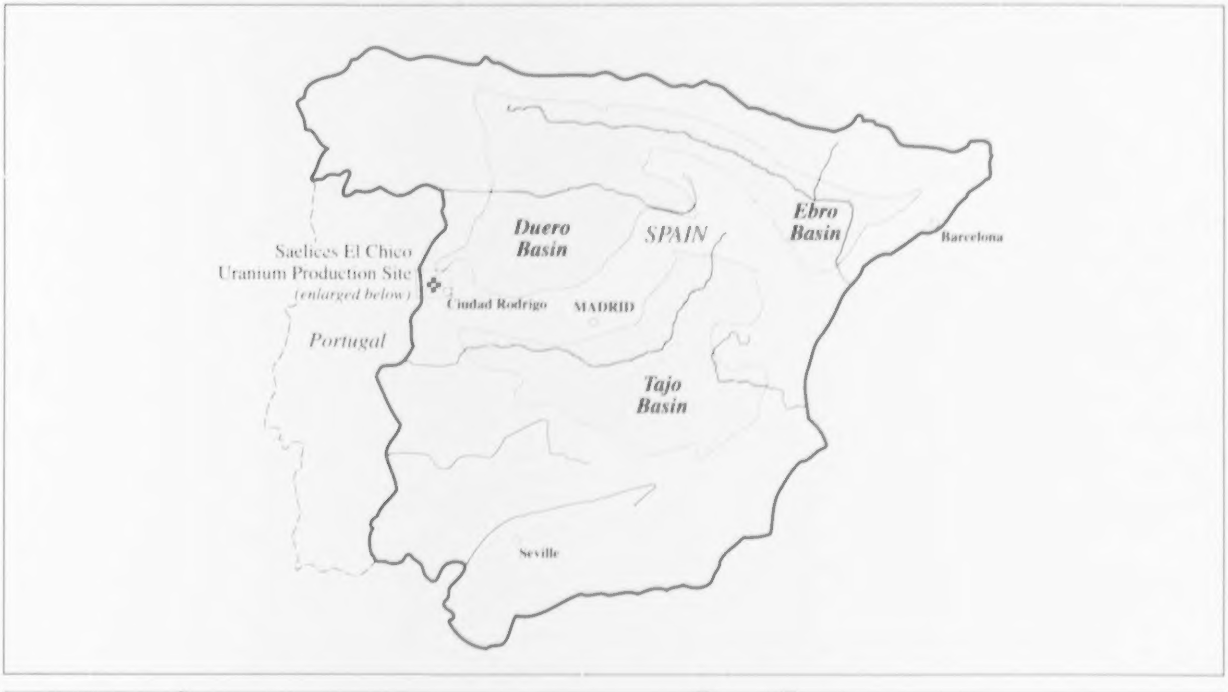
La Haba Facility

An experimental production facility previously existed in the area of La Haba near the city of Badajos. There was an open pit mining operation and also a processing plant (Lobo-G), which used a combination of agitated and heap leaching to produce a nominal capacity of 70 thousand pounds equivalent U_3O_8 per year. The facility began production in February 1983, but due to a combination of high production costs, increasing waste-to-ore ratios, and the difficulties experienced in extracting uranium from this ore, continued operation of the facility was deemed uneconomic, and the La Haba facility was closed in 1990.

Saelices el Chico Project

Spain's strategy for long-term uranium procurement is to increase the portion of requirements covered by domestic uranium production. Spain's only commercially active mine and processing plant are located in the area of Saelices el Chico. The area around Saelices el Chico is relatively flat and is traversed by the Rio Agueda. The uranium production center is located eight kilometers northwest of the town of Ciudad Rodrigo, about 90 km southwest of the city of Salamanca (the capital of the province), and about 260 km west of Madrid (**Figure 3**). The facility has a nominal production capacity totalling 550 thousand pounds equivalent U_3O_8 per year and has been

Figure 3
LOCATION OF GEOLOGICAL BASINS AND SAELICES EL CHICO URANIUM PROJECT


Duero Basin
SPAIN
Ebro Basin
Barcelona
Saelices El Chico Uranium Production Site (enlarged below)
Ciudad Rodrigo
MADRID
Portugal
Tajo Basin
Seville
ALAMEDA DEPOSIT
Prospective Mine Sites
Portugal
Alameda de Gardon
Saelices el Chico
"FE" DEPOSIT
ELEFANTE PLANT
QUERCUS PLANT
"D" DEPOSIT
FUTURE TRANSPORT ROUTE
15 kilometers
Agueda River
Fuentes de Onoro
Cuidad Rodrigo

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Spain's main uranium production center since it began production in 1974. **Figure 4** shows annual and cumulative U_3O_8 production from the project from 1975 through 1991. Production from the facility totalled nearly 600 thousand pounds equivalent U_3O_8 in 1991.

Due to the irregular nature of the veins, grade control and selective mining are important techniques in maintaining an acceptable mill feed grade. Drill holes for blasting are carefully monitored radiometrically, and samples are tested chemically. The ore is classified as either marginal or rich by a .06 w/o U_3O_8 cut-off point, and material under .02 w/o U_3O_8 is removed as waste. **Table 1** shows the portions of marginal and rich material produced at the Saelices el Chico facility from 1974 through 1991.

Front-end loaders with capacities of 2.5 to 4.5 cubic meters are used to load 35-tonne trucks. The marginal and rich ore is trucked to a crushing facility, and waste is taken to a dump where any seepage is collected for further processing. This seepage often contains uranium that has been naturally dissolved through bioleaching. The ore is crushed to sizes less than 100 mm and stacked in large rectangular piles for heap-leaching (**Figure 5**). The crushed ore then is bathed in an acid solution to extract the resident uranium.

Saelices el Chico Expansion

ENUSA is currently expanding the Saelices el Chico production facility. In December 1986, in accordance with the 1984 National Energy Plan (Plan Energético Nacional - PEN), ENUSA submitted a feasibility study to the National Institute of Industry (Instituto Nacional de Industria - INI) for the exploitation of deposits near Ciudad Rodrigo and construction of a new processing plant. In May 1987, INI authorized the investment, and in December 1987, ENUSA presented the application for construction of the project to the Ministry of Industry in

Figure 4
ANNUAL AND CUMULATIVE URANIUM PRODUCTION FROM THE SAELICES EL CHICO PROJECT

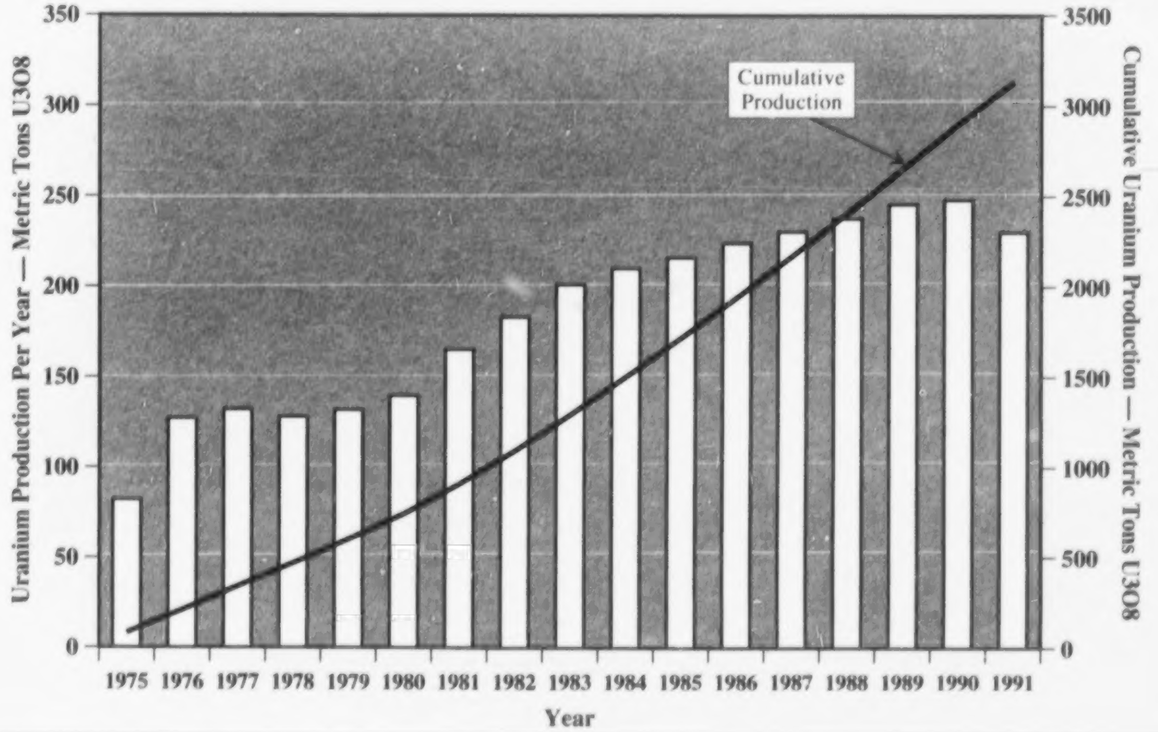

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Table 1
SAELICES EL CHICO URANIUM PROJECT—HISTORICAL PRODUCTION

Year	1974[1]	1975[2]	1976	1977	1978	1979	1980	1981	1982
					Metric Tons Mined				
Waste	194,265	553,585	1,076,015	2,101,164	2,778,204	2,908,609	3,563,238	1,654,995	1,473,170
Uranium Ore	65,114	196,115	214,531	247,353	370,021	430,589	436,950	333,088	386,563
– Rich[3]	23,384	70,003	89,559	124,690	136,028	136,642	133,869	115,919	118,809
– Marginal[4]	41,730	126,112	124,932	122,663	233,993	293,947	303,081	217,169	267,754
					Kilograms equivalent U_3O_8 Produced				
Concentrates	——	82,000	127,053	132,000	128,000	131,760	139,619	165,201	182,953

Year	1983	1984	1985	1986	1987	1988	1989	1996	1991
					Metric Tons Mined				
Waste	1,813,948	2,224,622	2,290,776	2,567,797	2,772,390	2,487,504	2,793,156	3,405,348	5,001,904
Uranium Ore	453,938	402,510	391,297	375,795	366,962	290,914	407,113	409,729	503,566
– Rich	129,976	133,178	109,918	103,575	110,046	107,797	99,044	85,406	86,929
– Marginal	323,962	269,332	281,379	272,220	256,916	183,117	308,069	324,323	416,637
					Kilograms equivalent U_3O_8 Produced				
Concentrates	200,984	210,032	216,017	223,945	230,303	237,693	245,595	248,001	230,007

[1] Exploitation of the FE deposit began in July 1974.
[2] The Elefante Plant was brought into operation in May 1975.
[3] Rich uranium ore is greater than or equal to 0.06 w/o U_3O_8.
[4] Marginal uranium ore is greater than 0.02 w/o U_3O_8, but less than 0.06 w/o U_3O_8.

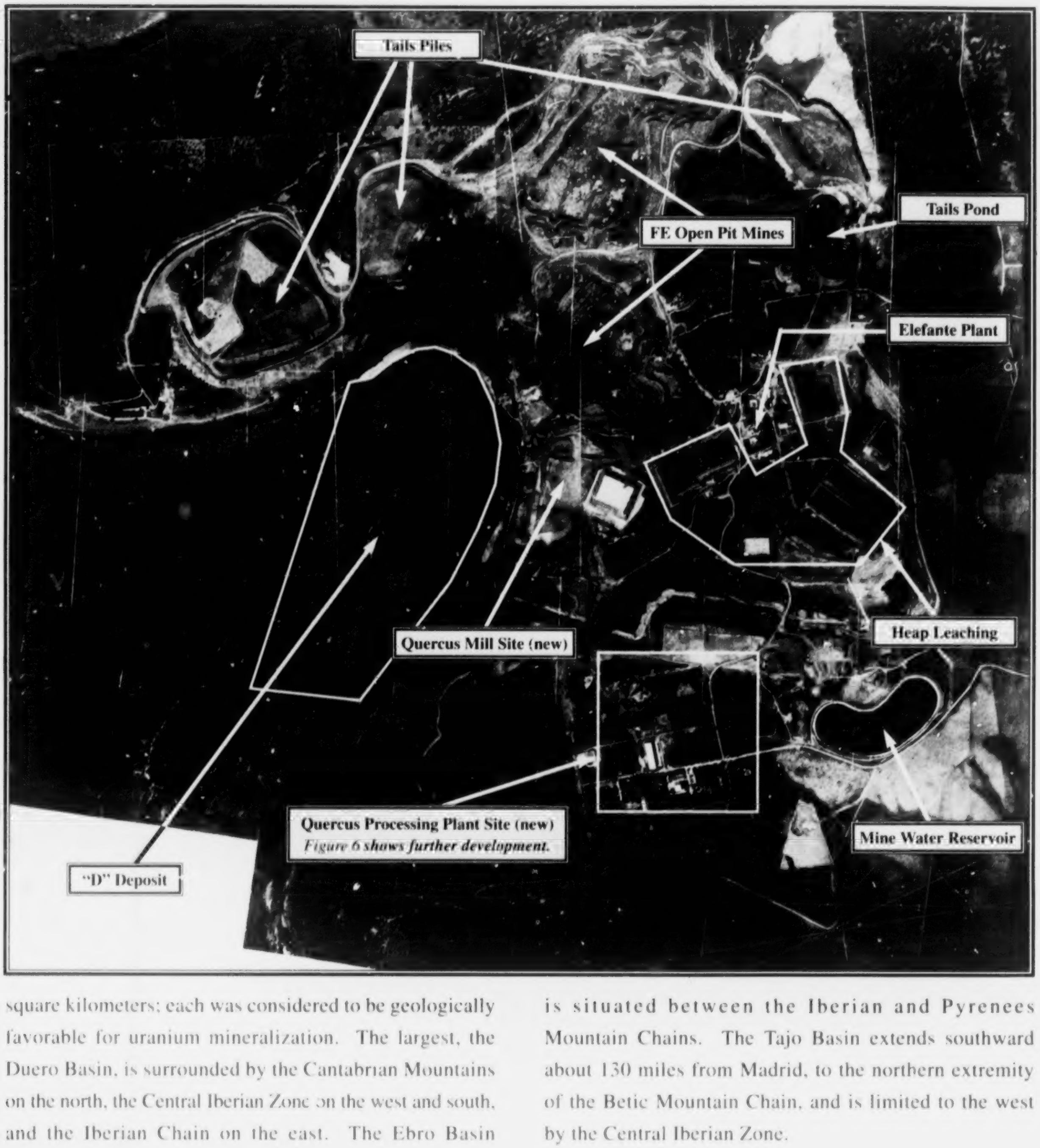
Salamanca province (Delegación Provincial del Ministerio de Industria en Salamanca). The project will require a capital expenditure of approximately US$76 million, half of which is being funded by a grant obtained in December 1989 from the European Regional Development Fund. This funding ensures the economic viability of the expansion project, in spite of the current market price for uranium concentrates.

The Quercus expansion project includes the construction of a conventional mill to replace the current heap leaching process (**Figure 6**). When the project is completed in 1993, ENUSA will be able to supply the majority of Spain's uranium requirements from domestic mining. The source of ore will be the Iberian schists located in the FE, D, and Alameda deposits, all located on the southwest edge of the Duero Basin. Mining will continue as an open pit operation. The processing plant will process one-third of the ore using agitated leaching technology, and the remaining two-thirds using heap leaching. This plant is based on the experience gained from the operation of the Elefante and Lobo-G plants and the results of numerous tests on the ore of the FE deposit. The plant optimizes process yields by using different processing techniques for different feed grades. The new plant will be able to process up to two billion pounds of ore per year, with a nominal production capacity of approximately 2.1 million pounds equivalent U_3O_8 per year.

GEOLOGY

Important uranium mineralization was discovered by JEN in at least three separate basins: the Duero Basin, the Ebro Basin, and the Tajo Basin (**Figure 3**). These tertiary basins represent a total area of approximately 100 thousand

Figure 5
SAELICES EL CHICO URANIUM PROJECT—COMPOSITE AERIAL PHOTO


Tails Piles
FE Open Pit Mines
Tails Pond
Elefante Plant
Heap Leaching
Quercus Mill Site (new)
Mine Water Reservoir
Quercus Processing Plant Site (new)
Figure 6 shows further development.
"D" Deposit

square kilometers; each was considered to be geologically favorable for uranium mineralization. The largest, the Duero Basin, is surrounded by the Cantabrian Mountains on the north, the Central Iberian Zone on the west and south, and the Iberian Chain on the east. The Ebro Basin is situated between the Iberian and Pyrenees Mountain Chains. The Tajo Basin extends southward about 130 miles from Madrid, to the northern extremity of the Betic Mountain Chain, and is limited to the west by the Central Iberian Zone.

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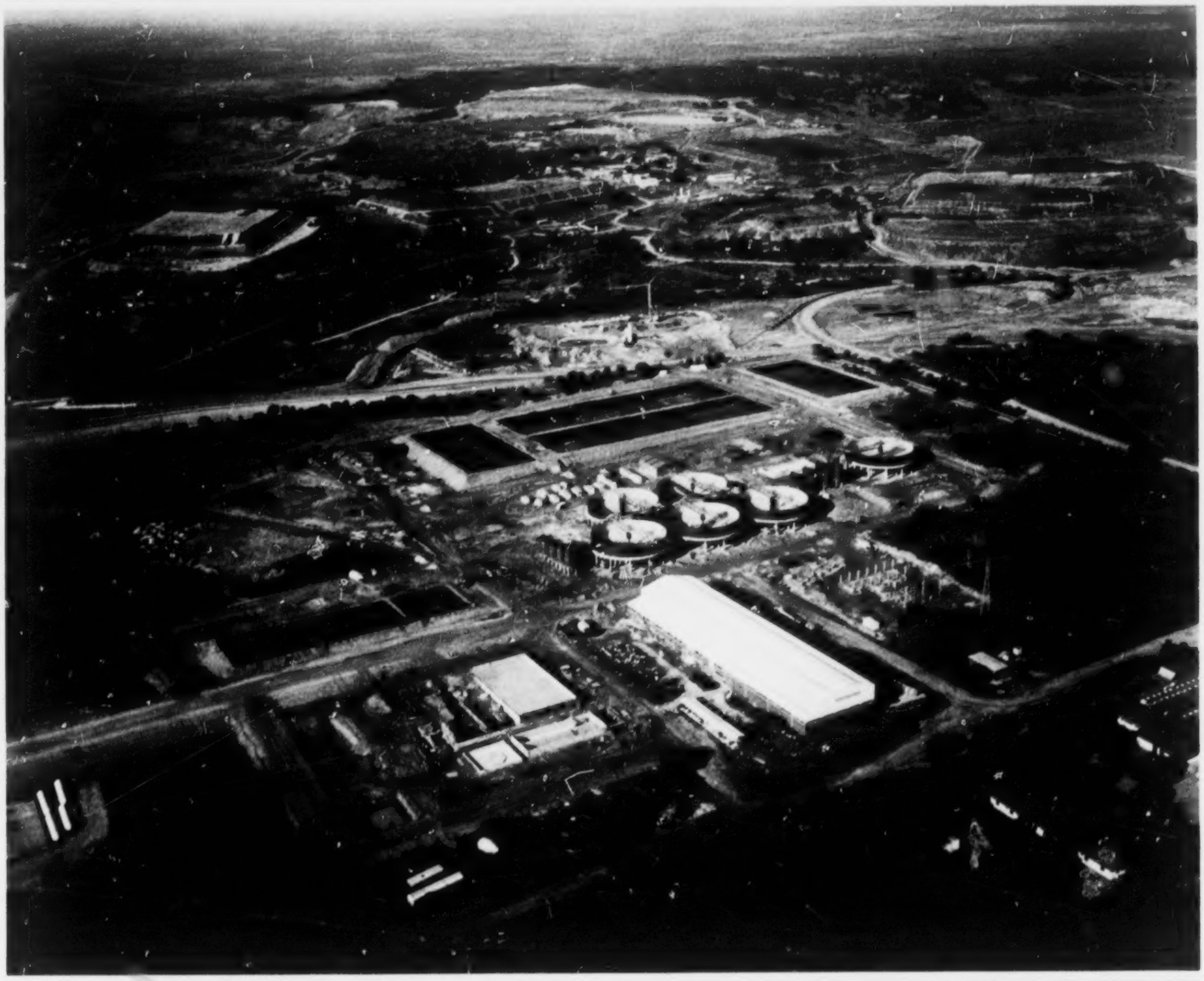

Figure 6 — Quercus Uranium Processing Plant Construction. Part of the expansion program at the Saelices el Chico Uranium Project. (*Photo courtesy of ENUSA*)

Spain's most important uranium deposits are not typical, not only in the European environment (with the exception of some mineralization in Portugal), but also globally. While most uranium deposits are found in sedimentary rocks, ENUSA's main deposits are found in metamorphic rocks. The properties identified by JEN were transferred to ENUSA for exploitation in 1973, and were estimated to contain approximately 13 million pounds equivalent U_3O_8 at an average ore grade of 0.10 w/o U_3O_8.

The most important uranium region is in Salamanca province, which includes the southwest corner of the Duero Basin. Salamanca's reserves are found as disseminations within the contact metamorphic aureoles, where Hercynian granites, found primarily in the western regions of Spain, have invaded pre-Devonian shales. This type of deposit

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is commonly referred to as an Iberian schist. The uranium mineralization commonly occurs in igneous and metamorphic rocks of the Paleozoic sequence.

As a result of regional tectonics, dating back as far as 350 million years, intervening low-lands were uplifted to form the high plateaus that are common throughout the Spanish interior. The plateau regions, known as mesetas, experienced continuing transformation through heavy erosion and structural subsidence well into Tertiary times. The mesetas collected varying thicknesses of coarse to fine Tertiary sediments. The source of the sedimentary material was the older rocks which eroded from the surrounding mountains. The Early Tertiary sediments filling the basins and the deeper Triassic and Jurassic rocks are considered favorable hosts for uranium mineralization.

The Iberian Meseta, which extends into the Salamanca province, has two structural blocks—a northern and a southern block. The northern block hosts a number of uranium deposits, whereas the southern block, composed predominantly of marine Upper Devonian and Carboniferous slates and greywackes, lacks granite intrusions and uranium deposits.

Two-thirds of the northern block is part of the Central Iberian Zone, which is composed essentially of a very thick sequence of weakly metamorphosed flysch-type schists and greywackes, probably of Upper Proterozoic and Lower Cambrian age. The southern third of the northern block is named the Ossa Morena Zone, and is widely underlain by Cambrian, Ordovician, and Silurian sediments and metasediments. Some acidic and basic volcanics are present in most stratigraphic units. During the Hercynian Orogeny, the northern block was folded along a NW-SE axis and extensively faulted and intruded by granites.

MINERALIZATION

The Ciudad Rodrigo uranium district, in Salamanca province, is located within the eastern section of the Iberian Meseta. The FE deposit is the principal uranium deposit being exploited by the Saelices el Chico production center in the Ciudad Rodrigo uranium district. The FE deposit occurs as a mineralized stockwork of veinlets within pelitic schists of Silurian and Cambrian age. The mineralization within the deposit consists principally of secondary uranium minerals such as autunite, uranotile, phosphuranylite, and torbernite. Pitchblende is the primary mineral. Pyrite is the main accessory mineral, although calcium carbonate is also common. The quantity of these accessory minerals is small, thus they do not cause problems during acidification treatment.

About 90 percent of Spain's ore reserves occur in Iberian schists. Secondary uranium minerals have concentrated on fracture surfaces in a zone 30 to 50 meters thick. The mode of mineralization resembles a typical enrichment blanket, whereby the slates above and below the blanket are almost completely barren of uranium. The pre-Devonian strata above and below the slate consists of alternating carbonaceous beds and quartzitic conglomerates, of which none are mineralized. The remaining ten percent of mineralization occurs as primary uranium minerals (pitchblende and coffinite) in veins and fractures within Hercynian granites.

The most important uranium deposits in Spain are found in Cambrian-Precambrian slates. Some of these deposits are located near the contact of the slates against Hercynian granites, with some of the mineralization reaching the granite. The primary mineral of these deposits is pitchblende, generally appearing in a network of deep breccias without a predominant direction.

CONCLUSION

Although the future of the nuclear industry in Spain remains uncertain, ENUSA is in the process of expanding the Saelices el Chico uranium production center. As Spain's strategy for long-term uranium procurement is to increase the portion of requirements covered by domestic uranium production, a reversal of the government's nuclear moratorium policy could lead to an even more rapid expansion of domestic production. Even if this occurred, Spain's known uranium reserves, and its advanced production facilities, will be able to supply most of the country's requirements well into the future.

Michael P. Ferguson

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INDIA'S NUCLEAR PROGRAM

India made an early commitment to being as self-sufficient as possible in nuclear energy and has largely achieved that goal. The country operates eight nuclear reactors with a total capacity of 1,304 MWe, and it remains committed to an aggressive growth plan for its nuclear industry, with six reactors currently under construction, and as many as twelve more planned. India also operates several heavy water production facilities, fabrication facilities, reprocessing works, and uranium mines and mills. Due to India's decision not to sign the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), the country has had to develop nearly all of its nuclear industry and infrastructure domestically. Overall, India's nuclear power program is self-contained and well integrated, with plans to expand to provide up to ten percent of the country's electrical generating capacity.

NUCLEAR POWER PROGRAM

Background

India's nuclear power program has at its roots the Tata Institute of Fundamental Research, founded in 1945 to carry out research in the field of atomic energy. The next major step was the passage of India's Atomic Energy Act in 1948. The Act outlined a specific atomic energy program for the country and established the Atomic Energy Commission (AEC), which is responsible for formulating policies for the Department of Atomic Energy (DAE) and preparing its budget, as well as ensuring the implementation of government policies regarding atomic energy. The AEC oversees all of India's activities related to nuclear power.

Since the mid-1970s, India's nuclear program has operated independently of the rest of the world's nuclear commerce. In 1963, India and the USA signed a 30-year nuclear cooperation agreement, in which the USA promised to provide enriched uranium fuel for US nuclear reactors then being considered for purchase by India. Following the signing of the agreement, India ordered two General Electric boiling water reactors (BWRs) that were built at Tarapur, and placed in operation in 1969.

In 1968 India refused to sign the NPT, claiming it was discriminatory in that its restrictions were not applied equally. Moreover, the 1974 explosion of what India termed a "peaceful" nuclear device strongly affected India's international political relations and its commercial nuclear power program. Prior to the 1974 explosion, Atomic Energy of Canada Ltd. (AECL) had been heavily involved in the Indian nuclear program, in design and construction of both research and power reactors. India had selected the CANDU technology for its third and fourth reactors (Rajasthan Units 1 and 2), in part because the natural uranium fuel used by the pressurized heavy water reactors (PHWR) would not require enrichment. For this reason, the fuel could be supplied largely from domestic sources, and therefore would not be subject to restrictions on its disposition after use in the reactor. Following the bomb test however, the Canadians stopped all assistance, cancelling the supply of equipment for the Rajasthan units and essentially terminating nuclear cooperation with India. Under Indian guidance alone, the Rajasthan units were eventually completed, although after considerable delay.

In 1977, the US Government announced its dissatisfaction with its 1963 bilateral cooperation agreement with India, a situation aggravated by India's refusal to accept full-scope IAEA safeguards for the country's nuclear facilities. In 1978, the US Congress passed the Nuclear Non-Proliferation Act (NNPA), tying US exports of nuclear fuel and equipment to the conclusion of new bilateral safeguards agreements, and leading to a dispute between the USA and India regarding the remaining fuel deliveries specified under the 1963 pact.

In the fall of 1980, President Carter approved a final delivery of US enriched uranium fuel to be made to Tarapur. Between 1981 and mid-1983, with political relations between India and the USA showing considerable strain and the fuel dispute still unresolved, the Tarapur units were forced to operate at less than half of capacity. By late 1982, a partial solution was agreed upon, in which France would assume US obligations to provide India with fuel, totalling approximately 20,000 kgU as UF$_6$ enriched to approximately 2.7 w/o ^{235}U. The first French delivery was made in May 1983.

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Also in the early 1980s, US export of nuclear spare parts to the Tarapur plant became a controversial issue, as the US Congress viewed such export sales as a violation of the NNPA. Considering India's nuclear test and its refusal to allow indefinite inspections of Tarapur, the US Nuclear Regulatory Commission denied GE and several subcontractors export licenses for plant equipment. Eventually, India either procured most of the required spare parts from European suppliers or fabricated the parts domestically.

The issue of India's reprocessing rights and safeguards has not subsided. Most of the country's nuclear program is not covered by any international safeguards agreements, having been built and fueled to a large extent indigenously. India steadfastly maintains that all of its plutonium resources are, and will be, used for peaceful projects, such as the fueling of the fast breeder reactors planned for the next century. In developmental terms, India's unwillingness to conform to international safeguards conventions drastically limits its access to nuclear technology worldwide.

Nuclear Power Strategy

India's nuclear power program is comprised of three stages; the first stage originally was planned to provide 10,000 MWe of installed capacity by the year 2000. In addition to the reactors already built or under construction, this first stage called for construction of twelve more 235-MWe PHWRs, and ten 500-MWe PHWRs, bringing total capacity to more than 10,000 MWe and providing an estimated ten percent of the country's total generating capacity. However, in August 1991, AEC Chairman Dr. P. K. Iyengar announced that due to financial constraints, the goal had been reduced to 9,000 MWe by the year 2000, including 2,000 MWe of capacity from Soviet-supplied VVERS. Since those VVER reactors have since been cancelled, the revised goal is now 7,000 MWe.

The second stage of the country's nuclear plan is to develop commercial fast breeder reactors. While India is actively conducting research and development in this area, progress has been slow. The government continues to support these efforts but has stated that the 40-MWt fast breeder test reactor (FBTR) at Kalpakkam must demonstrate it can operate successfully before additional funding for a 500-MWe prototype FBR will be granted.

The breeder reactor development of the second stage is critical for stage three. India has the largest thorium-232 deposits in the world. The third stage of the country's long-term plans is to utilize this domestic source by using it as a blanket in breeder reactors and converting it into uranium-233. However, these plans are scheduled well into the next century, and most of the country's efforts are now focused on the immediate need for power that additional PHWRs can provide.

Operating Stations

India's first reactors, two GE-supplied 150-MWe BWRs, located at Tarapur about 100 km north of Bombay, began commercial operation in October 1969. Since that time, India's Nuclear Power Corporation (NPC), a public limited company under DAE responsible for operating reactors in the country, has brought six 220-MWe PHWRs on line. This includes Narora 2, which reached criticality in December 1991, and is expected to reach commercial operation later this year. During 1991, the seven reactors operating commercially throughout the year generated 5,105 GWh of electricity with an average capacity factor of 45 percent (**Table 1**). This accounts for almost three percent of all electricity generated in India.

The BWRs at Tarapur are India's only reactors built on a turn-key basis by non-Indian contractors. The two reactors were built in five years, and had about 30 percent Indian participation in the project. The AEC's strategy has been to build the country's nuclear program based on the PHWR design, but the AEC recognized it would be effective to gain experience in the construction and management of nuclear power plants by working with outside contractors on the country's first nuclear station. This strategy also would result in faster construction times required to address the country's energy shortage.

While the BWR station has had difficulties historically (e.g., securing spare parts and enriched fuel), overall the plant has performed fairly well. In 1991, units one and two achieved 61 percent and 67 percent capacity factors, respectively. Together, the two units have generated more than 40 billion kWh during their lifetimes. Last fall, the Department of Atomic Energy approved a Plant Life Extension program for the station. Studies have already

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Table 1
NUCLEAR POWER UNITS IN INDIA

Units In Operation

Unit	Lead Utility or Fuel Buyer	Capacity (MWe net)	Type	COD[1]	1991 Capacity Factor (percent)	Total 1991 Electricity Generation (GWh net)
Kalpakkam 1 (MAPS)	NPC[2]	175	PHWR	1984	36	552
Kalpakkam 2 (MAPS)	NPC	175	PHWR	1985	76	1,169
Narora 1 (NAPS)	NPC	220	PHWR	1991[3]	28	545
Rajasthan 1 (RAPS)	NPC	207	PHWR	1973	12	226
Rajasthan 2 (RAPS)	NPC	207	PHWR	1981	51	933
Tarapur 1 (TAPS)	NPC	150	BWR	1969	61	806
Tarapur 2 (TAPS)	NPC	150	BWR	1969	67	874
TOTAL		**1,284**		*(1991 Average:*	**45)**	**5,105**

Units Under Construction and Planned

Unit	Lead Utility or Fuel Buyer	Capacity (MWe net)	Type	COD[1]	Percent Complete[4]
Kaiga 1	NPC	220	PHWR	1995	40
Kaiga 2	NPC	220	PHWR	1996	40
Kakrapar 1 (KAPP)	NPC	220	PHWR	1993	89
Kakrapar 2 (KAPP)	NPC	220	PHWR	1994	89
Narora 2 (NAPP)	NPC	220	PHWR	1992	100
Rajasthan 3 (RAPP)	NPC	220	PHWR	1995	31
Rajasthan 4 (RAPP)	NPC	220	PHWR	1996	31
Rajasthan 5 (RAPP)	NPC	470	PHWR	——	planned
Rajasthan 6 (RAPP)	NPC	470	PHWR	——	planned
Rajasthan 7 (RAPP)	NPC	470	PHWR	——	planned
Rajasthan 8 (RAPP)	NPC	470	PHWR	——	planned
Tarapur 3 (TAPP)	NPC	470	PHWR	2000	planned
Tarapur 4 (TAPP)	NPC	470	PHWR	2001	planned
Trikkareppur 1	NPC	470	PHWR	——	planned
Trikkareppur 2	NPC	470	PHWR	——	planned
Trikkareppur 3	NPC	470	PHWR	——	planned
Trikkareppur 4	NPC	470	PHWR	——	planned
Trikkareppur 5	NPC	470	PHWR	——	planned
Trikkareppur 6	NPC	470	PHWR	——	planned
Trikkareppur 7	NPC	470	PHWR	——	planned
Trikkareppur 8	NPC	470	PHWR	——	planned
TOTAL		**8,120**			

[1] COD = Commercial Operation Date (actual or expected)

[2] NPC = Nuclear Power Corporation (Department of Atomic Energy)

[3] Source: NPC—Contrary to other sources, NPC stated that Narora 1 was declared in commercial operation on January 1, 1991. As the plant operated effectively for the full year, a capacity factor is shown and its generation is included in calculation of the 1991 Average Capacity Factor.

[4] Source: *Nuclear News*. Construction progress as of December 31, 1991.

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begun on extending the life of the plants by 20 years, and preliminary results indicate that the extension is both economically and technically feasible. Additional studies are on-going, and station managers must submit a life extension application to India's Atomic Energy Regulatory Board by 1998.

India's second nuclear power station was built at Rana Pratap Sagar Lake, 64 km southwest of Kota, in the state of Rajasthan. The Rajasthan Atomic Power Station (RAPS) contains two 207-MWe PHWRs of the CANDU type, designed by AECL. Unit 1 began commercial operation in 1973, and Unit 2 was commissioned in 1981. Unit 1 has had a difficult operating history: the lifetime capacity factor for the plant is only 22 percent. Initially, the plant was connected to an unstable electrical grid that had only a 500-MWe capacity. Consequently, any disturbance in the grid frequency often caused disturbance in the station process system, leading to frequent reactor tripping and severe strain on station equipment. The most severe problem was first discovered in September 1981 when cracks developed in the end shield of the reactor vessel. Various methods were used to try to repair the cracks, but the reactor was essentially shut down until February 1985. The reactor was restarted, but operated for only three months before new cracks appeared. Finally, the cracks were repaired by August 1987 using mechanical plugs and graphoil gaskets. The unit was restarted and continues to operate, but is limited to 50-percent power to prevent further cracks.

Completion of Unit 2 was delayed until 1981, due to Canada's withdrawal of nuclear assistance following India's "peaceful" nuclear explosion. From lessons learned in the operation of Unit 1, the AEC incorporated several improvements into Unit 2, and the second unit has operated satisfactorily with a lifetime capacity factor of 59 percent. The maximum output of Unit 2 also has been limited, although to a lesser degree than Unit 1. The reason for the limitation is that the average temperature of the cooling water source at RAPS is 28°C—seven degrees warmer than AECL's design basis—thereby limiting the plant's production to about 86 percent of its maximum designed output, due to condenser vacuum limitations. In 1991, Unit 2 generated 933 GWh (net) at an average capacity factor of 51 percent.

The Madras Atomic Power Station (MAPS) located at Kalpakkam in Tamil Nadu state is almost all domestically supplied. Over 85 percent of the twin 175-MWe PHWR station was provided by Indian sources. Both reactors had an original design basis of 235-MWe (gross), slightly larger than the designed capacity at RAPS. But due to failures in the coolant inlet manifolds in 1989, NPC had to redesign the coolant circuit, which led to downrating the plant's net capacity to 175 MWe. Unit 1 had a capacity factor of 36 percent in 1991, and Unit 2 achieved a 76 percent capacity factor.

India's newest nuclear station is located at Narora in Uttar Pradesh state in northern India (**Figure 1**). Unit 1, a 220-MWe PHWR, first reached criticality in March 1989, but was not declared officially in commercial operation until January 1, 1991. Unit 2 achieved criticality in late 1991, and is expected to be commissioned in 1992. These units, like the units at RAPS and those under construction, originally claimed a 235-MWe gross capacity rating, but operational experience, as well as limitations on the turbine generators, have led NPC to assess the gross sustainable capacity of the newer plants at 220 MWe each.

Units Under Construction

India's Nuclear Power Corporation also is responsible for construction of nuclear reactors in the country. NPC currently is overseeing construction of six reactors at three stations: Kakrapar 1 and 2; Kaiga 1 and 2; and Rajasthan 3 and 4. [Note—operating stations are called atomic power stations, such as RAPS, whereas facilities under construction are called atomic power projects, such as KAPP].

Construction at Kakrapar 1 is more than 90-percent complete, and initial criticality was planned for late 1991. However, in mid-October a fire occurred in the switchyard of the unit. Although causing only minor damage to non-nuclear components, the incident has delayed the initial criticality of the unit until mid-1992. Unit 1 is expected to reach commercial operation in 1993, and Unit 2, a twin 220-MWe PHWR, is expected to reach commercial operation one year later.

Like all of India's reactors under construction, Kaiga Units 1 and 2 are 220-MWe PHWRs. The station, located near the Arabian Sea in southwestern India, is more than 40-percent complete and is expected to reach commercial operation in 1996. NPC also has two more PHWRs under construction at its RAPS site. Rajasthan 3 and 4 are approximately 31-percent finished and planned for operation in 1996.

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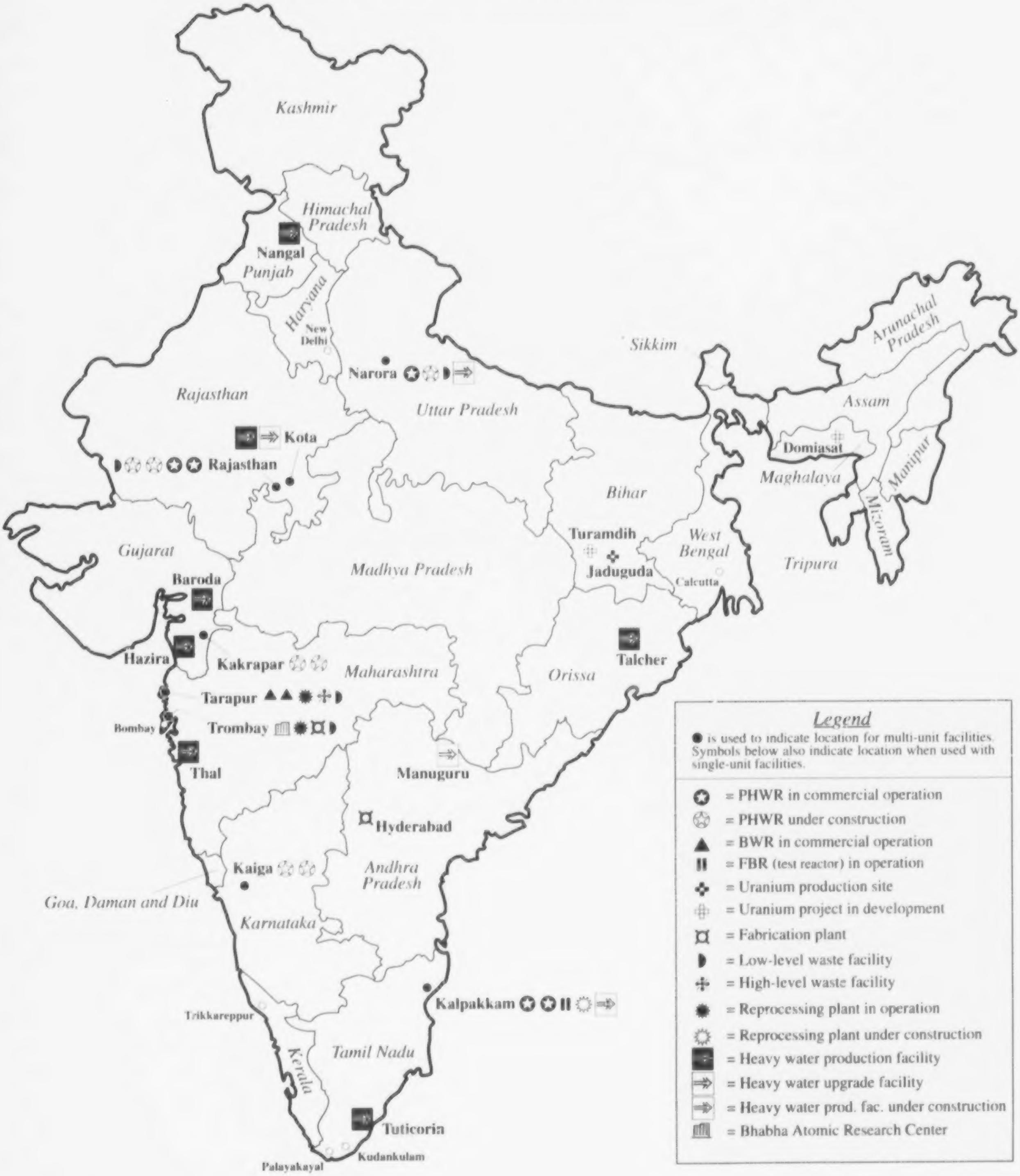
Figure 1
NUCLEAR POWER STATIONS AND FUEL CYCLE FACILITIES OF INDIA


Kashmir
Himachal Pradesh
Nangal
Punjab
Haryana
New Delhi
Narora
Sikkim
Arunachal Pradesh
Rajasthan
Uttar Pradesh
Assam
Kota
Rajasthan
Domiasat
Maghalaya
Manipur
Bihar
Mizoram
Turamdih
West Bengal
Gujarat
Madhya Pradesh
Jaduguda
Tripura
Baroda
Calcutta
Hazira
Kakrapar
Maharashtra
Orissa
Talcher
Tarapur
Bombay
Trombay
Thal
Manuguru
Hyderabad
Kaiga
Andhra Pradesh
Goa, Daman and Diu
Karnataka
Kalpakkam
Trikkareppur
Tamil Nadu
Kerala
Tuticorin
Palayakayal
Kudankulam
Legend
● is used to indicate location for multi-unit facilities. Symbols below also indicate location when used with single-unit facilities.
= PHWR in commercial operation
= PHWR under construction
▲ = BWR in commercial operation
= FBR (test reactor) in operation
= Uranium production site
= Uranium project in development
= Fabrication plant
= Low-level waste facility
= High-level waste facility
= Reprocessing plant in operation
= Reprocessing plant under construction
= Heavy water production facility
= Heavy water upgrade facility
= Heavy water prod. fac. under construction
= Bhabha Atomic Research Center

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Planned Reactors

In addition to the six PHWRs under construction, India has plans for twelve more. Two more PHWRs are planned for the Kaiga site, and two 500-MWe PHWRs have been approved for construction at Tarapur. The Indian government agreed in early 1991 to finance the units, and the projects already have been granted the necessary environmental, technological, and safety approvals.

In mid-1991, the AEC announced it had selected Trikkareppur in the state of Kerala as the future site of India's largest nuclear power station. When completed, the station will include eight 500-MWe units, with initial electrical production planned for 1997. However, much of the funding for the station was to come from the former Soviet Union, under an Indo-Soviet nuclear cooperation agreement. Although plans for the station are progressing, the construction schedule may be delayed considerably due to lack of funding.

The AEC also has been considering plans for four 500-MWe units at Rajasthan, although they are still in the formative stages. India had plans for two 1,000-MWe VVERs at Kudankulam, to be supplied by the Soviet Union. However, those plans have been cancelled, due to the dissolution of the Soviet Union.

FUEL CYCLE FACILITIES

Heavy Water Facilities

In support of its aggressive nuclear program that relies on PHWRs, India has developed significant heavy water production capacity. The country's first plant began operation in 1962 at Nangal with a capacity of 14 metric tonnes per year. A separate division of the Department of Atomic Energy known as the Heavy Water Board (**Figure 2**) oversees the construction and operation of all heavy water plants in the country.

Most of India's heavy water plants are operated in conjunction with fertilizer plants, using synthesis gas as feedstock in a bithermal ammonia-hydrogen exchange process. Other inputs obtained from the fertilizer plants are ammonia, steam, and nitrogen. The heavy water plants have been particularly affected by problems associated with their dependence upon the fertilizer plants, such as poor or intermittent electricity supply, and interruptions in supply of feedstocks and other necessary inputs. At Baroda and Tuticorin, the synthesis gas has at times also contained less than design levels of deuterium. Since efficient operation of the heavy water plants depends to a great extent on smooth, uninterrupted operation, such problems have caused production to be considerably reduced from rated capacity in some cases.

India currently operates seven heavy water plants. The facilities at Baroda, Nangal, Tuticorin, Talchar, and the newly commissioned plant at Hazira, are based on the ammonia-hydrogen exchange process. Due to power shortages to operate the electrolysis plant at Nangal, a new plant was built to generate pure hydrogen by naptha reforming and pressure-swing adsorption. The heavy water plant at Nangal now processes the feed gas from this unit, which has significantly improved its production. The plant at Kota uses the hydrogen sulfide-water exchange process. The other operational plant is located at Thal, in Maharashtra state; it produces heavy water using an ammonia-water exchange process. **Table 2** lists the operating plants and their capacities, and also includes the Manuguru plant in Andhra Pradesh that is in the final stages of construction. This plant will use a hydrogen sulfide-water (steam) process to achieve a planned capacity of 185 tonnes per year. It is expected to become fully operational later this year.

In addition to the plants that produce heavy water, the Department of Atomic Energy also has three heavy water upgrading plants at Kalpakkam, Kota, and Narora. These plants recover the tritium and refurbish the down-graded heavy water collected from operating reactors. Combined, the country's various heavy water facilities are sufficient to supply all the nation's requirements only if the heavy water plants operate well. As a result, India has set aside some funds to purchase heavy water internationally, when necessary.

Fabrication

India's overriding goal for its nuclear program is self-sufficiency throughout the fuel cycle. To this end, the country has developed a nuclear fuel complex at Hyderabad to fabricate fuel for all the nation's reactors. The complex produces natural UO_2 fuel bundles for the Rajasthan, Madras, and Narora stations, as well as enriched uranium fuel assemblies for the Tarapur BWRs. The facility also produces the core axial subassemblies and thorium blanket

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Figure 2
ATOMIC ENERGY COMMISSION ORGANIZATION CHART

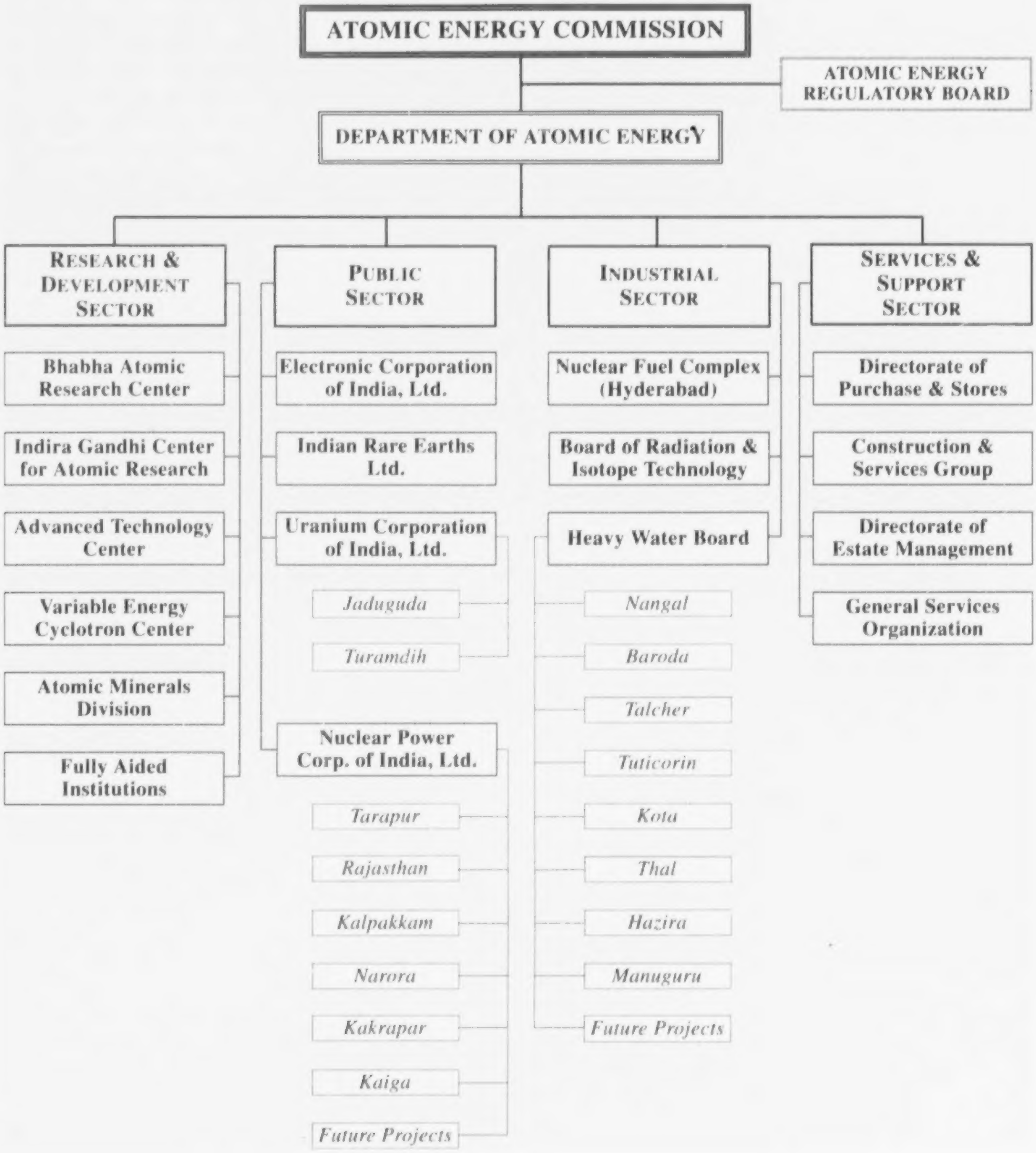
ATOMIC ENERGY COMMISSION
ATOMIC ENERGY REGULATORY BOARD
DEPARTMENT OF ATOMIC ENERGY
RESEARCH & DEVELOPMENT SECTOR
Bhabha Atomic Research Center
Indira Gandhi Center for Atomic Research
Advanced Technology Center
Variable Energy Cyclotron Center
Atomic Minerals Division
Fully Aided Institutions
PUBLIC SECTOR
Electronic Corporation of India, Ltd.
Indian Rare Earths Ltd.
Uranium Corporation of India, Ltd.
Jaduguda
Turamdih
Nuclear Power Corp. of India, Ltd.
Tarapur
Rajasthan
Kalpakkam
Narora
Kakrapar
Kaiga
Future Projects
INDUSTRIAL SECTOR
Nuclear Fuel Complex (Hyderabad)
Board of Radiation & Isotope Technology
Heavy Water Board
Nangal
Baroda
Talcher
Tuticorin
Kota
Thal
Hazira
Manuguru
Future Projects
SERVICES & SUPPORT SECTOR
Directorate of Purchase & Stores
Construction & Services Group
Directorate of Estate Management
General Services Organization

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Table 2
INDIA'S HEAVY WATER PLANTS

Plant	Process	Capacity (tonnes/yr)	COD [1]
Baroda	ammonia-hydrogen	67	1980
Hazira	ammonia-hydrogen	110	1991
Kota	hydrogen sulfide-water	100	1981
Nangal	ammonia-hydrogen	14	1962
Talcher	ammonia-hydrogen	62	1980
Thal-Vaishet	ammonia-water	110	1987
Tuticorin	ammonia-hydrogen	71	1978
Manuguru	hydrogen sulfide-water	185	1992 [2]

[1] Commercial Operation Date (actual or expected)

[2] The Manuguru plant is in the final stages of construction, and is expected to be commissioned in 1992.

subassemblies for the FBTR at Kalpakkam. As part of its comprehensive fuel production capability, the complex also manufactures Zircaloy and zirconium-niobium alloys for fuel element cladding. Fuel also is fabricated at the Bhabha Atomic Research Center (BARC) near Bombay. That plant can produce up to 135 MT per year of PHWR fuel. At both facilities, PHWR fuel is made from magnesium diuranate, which is then converted into UO_2. Fuel for the BWRs at Tarapur is fabricated at the Hyderabad complex from imported enriched UF_6. Enriched fuel imported for use in the Western-constructed reactors is subject to international safeguards.

In mid-1991, the DAE announced plans to invest over seven billion rupees (US$270 million) during the next decade to build and expand its nuclear fuel production capability. Plans for the Hyderabad complex include increasing the UO_2 pellet production capacity from 350 metric tonnes per year to 660 MT per year; building a uranium fuel assembly plant with a 600 MT per year capacity; and commissioning a 150 MT-per-year Zircaloy fabrication plant. All three of these facilities are scheduled for completion by 1994.

The Department also plans to build a 300 MT-per-year zirconium sponge plant at Palayakayal in Tamil Nadu. The two billion rupee plant will produce reactor-grade zirconium and is scheduled for completion in 1994. All four of these new projects have received the necessary regulatory, technical, and environmental approvals.

Reprocessing

Reprocessing of spent fuel takes place at several facilities. India's first reprocessing plant was built at the BARC complex in Trombay and was commissioned in 1964 with a capacity of about 30 tonnes per year. The Indian-designed and built plant uses the Purex process with solvent extraction columns. Fuel reprocessed at BARC comes mainly from the Cirus 40-MWt, heavy water moderated, research reactor located at the Center.

The primary reprocessing plant in India is known as the PREFRE facility, located near the Tarapur reactor site. Commissioned in 1982, the 100 tonne-per-year facility has reprocessed fuel from the Tarapur, Rajasthan, and Madras reactors, as well as plutonium destined for use in the FBTR. This plant operates under international safeguards only when reprocessing safeguarded material, such as enriched UF_6 imported from France. When reprocessing domestic fuel material, no such safeguards apply to its operation.

The plant has been used very infrequently since its start up. AEC Chairman Iyengar indicated earlier this year that the amount of fuel reprocessed is well below the capacity of the plant, and that only twice has a series of unsafeguarded material from the Madras station been reprocessed. This Madras material has produced enough plutonium to manufacture two cores for the FBTR at Kalpakkam.

India also is about to complete a new plant at Kalpakkam for reprocessing spent Zircaloy-clad UO_2 fuel. The 125 MT-per-year facility is scheduled to go into hot operation late this year. As a result, the PREFRE facility will be used only occasionally for reprocessing safeguarded material from Tarapur. Any other reprocessing will be completed at the new Kalpakkam facility. India does not plan to build a single large reprocessing complex like those in France or Japan, but rather will build smaller facilities, as demand requires, at locations near the country's reactors.

India announced in mid-1991 that it is offering to reprocess foreign spent fuel from research reactors of other countries. India will require that the fuel be subject to IAEA safeguards and that the wastes from the reprocessing process must be shipped back to the country of origin. The offer is part of India's larger effort to export nuclear technology and consultant services abroad, particularly in the area of small research reactors.

Waste Management

India operates low- and intermediate-level waste management facilities at Trombay, Tarapur, Rawatbhatta (Rajasthan), and Narora. These plants process the wastes generated from the nearby nuclear stations. The DAE also operates a facility near the Tarapur complex to process high-level wastes. In 1990, the Waste Immobilization Plant (WIP) at Tarapur successfully vitrified waste from the PREFRE reprocessing plant, and research continues in this area to allow vitrification of wastes with higher specific activity. As part of its interim storage plans, the DAE also is developing an away-from-reactor spent fuel storage facility at Tarapur and another WIP facility at Trombay. India has done some preliminary work in identifying a long-term waste disposal site, but no particular location has been selected yet.

URANIUM INDUSTRY

India maintains a large, on-going uranium exploration program to meet the country's domestic nuclear fuel requirements. Exploration, mining, and milling of uranium and thorium takes place under the auspices of the DAE. One of the first institutions started under the DAE was the Atomic Minerals Division (AMD), which operates regional centers for exploration and research. The state-owned Uranium Corporation of India, Ltd. (UCIL) and India Rare Earths, Ltd. conduct production operations for uranium and thorium, respectively.

India's known reserves of uranium are not particularly large, estimated by OECD/IAEA to total 64,600 metric tonnes of uranium (MTU). Of these, about 41,100 MTU of Reasonably Assured Resources are in the under $80/kg category, about 6,200 tonnes are in the $80-130/kg category, and 17,300 tonnes are classified as Estimated Additional Resources. The major focus of uranium exploration and development has been in the Singhbhum thrust belt, west of Calcutta in the state of Bihar. The AMD also has expanded its exploration efforts outside this area in recent years. In 1991, this expanded search effort paid off: the DAE announced late in the year that it had located a major uranium deposit at Domiasat in northeast India in the state of Meghalaya. The sandstone-type deposit is the largest and richest deposit yet discovered in India. It covers an area of more than ten square kilometers, ranging in depth from 5 to 50 meters, with ore grades as high as 0.41 w/o U_3O_8.

Jaduguda

Within the Singhbhum district, UCIL manages its sole operating uranium mining and milling facility at Jaduguda. The Jaduguda mine was one of the first mines to have been developed indigenously by India. The first stage of mine development was sinking a main shaft 315 meters deep. This was completed in 1968 and also marked the start of production from this underground mine. Stage two was completed in 1977; it opened up new mining areas below 300 meters and extended the main shaft down to 640 meters in depth. All ore now produced from this mine comes from below the 300-meter level.

The third stage of this mine's development is to sink another shaft, from 555 meters to 900 meters deep. The Indian government has approved the 1992 budget for UCIL to begin sinking this shaft. The new shaft is expected to be complete by 1994, and any additional production from this mine in the upcoming decade will come from the depths accessed by this new shaft.

The Bhatin mine is located about three kilometers from Jaduguda. It is a small underground mine that can produce about 250 tonnes of ore per day, although at relatively low grade. Ore is transported daily by truck to the Jaduguda mill.

The Jaduguda mill was commissioned in 1968 and processes primary ores from the Jaduguda and Bhatin mines. Between five and ten percent of the uranium processed at the mill comes from uranium mineral concentrates recovered from copper tailings of the Surda, Mosaboni, and Rakha copper mines. Ore from the nearby uranium mines is crushed, ground, and leached with sulfuric acid. The pregnant solution is then filtered and precipitated in the form of magnesium diurinate. The yellowcake is then packed in drums and sent to the nuclear fuel complex at Hyderabad for processing into nuclear fuel. The mill produced near its capacity in 1991, with an output of approximately 550 thousand pounds equivalent U_3O_8.

Turamdih

The other important uranium project in India is the mining and milling facility being developed at Turamdih. The project is also in the Singhbhum district, about 25 kilometers west of Jaduguda. Two conventional mines, named Turamdih and Narwapahar (about 13 km from Turamdih) are being developed. When completed in the mid-1990s, each mine will be capable of producing 1,500 tonnes of ore per day at an average grade of 0.04 w/o U_3O_8. The mining method is expected to be the same as Jaduguda: cut and fill, with the mined out stopes backfilled with deslimed mill tailings. The tailings would be directed into the stopes through drill holes from the surface.

UCIL has been allocated 320 million rupees (US$11.4 million) in the FY1992 budget for development of the two mines and the mill at Turamdih. The mill's planned capacity is almost one million pounds U_3O_8 annually, and output from the mill is projected at around 750 thousand pounds U_3O_8 per year. Production from this project is expected to begin in the mid- to late-1990s, as production from the Jaduguda facility is phased out.

CONCLUSION

India maintains one of the world's most aggressive plans for growth of its nuclear industry. Because of safeguards issues, the country has had to develop all of its fuel cycle domestically, slowing its progress. Nevertheless, the country's accomplishments in the nuclear field are remarkable. The Department of Atomic Energy remains committed to building more PHWRs and additional heavy water facilities, and to developing a fast breeder reactor program that will capitalize on the country's vast thorium deposits. Efforts now are focused on improving the performance of the country's reactors and heavy water plants, and on further identifying and developing its uranium deposits.

While India's nuclear power development will continue to be hampered by its refusal to sign the NPT, the recent signing of the treaty by China and France, and offers to negotiate a nuclear-weapons-free zone by Pakistan, make it likely that India will at least reconsider its safeguards position in upcoming years. Meanwhile, the country continues to expand its nuclear program in order to provide the immense amount of power required as the nation develops.

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NUCLEAR INDUSTRY CALENDAR

1992	
May 17-19	***19th Annual Meeting & Int'l Conference on Nuclear Energy*** (Hotel Diplomat, Prague, CSFR). Sponsored by World Nuclear Fuel Market. Contact: Donna Cason; 404-447-1144; Fax: 404-447-1797.
June 7-11	***American Nuclear Society Annual Meeting*** (Boston Marriott, Copley Place, Boston, Massachusetts). Contact: ANS Meetings Department; 708-352-6611.
June 23-24	***Nuclear Forum '92*** (Royal Garden Hotel, London, United Kingdom). Sponsored by the British Nuclear Forum. Contact: Ms. Ipek Yigit, Manager for Public and Industrial Affairs, British Nuclear Forum; phone: 071-828-0116; Fax: 071-828-0110; Address: 22 Buckingham Gate, London, SW1E 6LB, England.
Sept. 9-11	***Uranium Institute 17th Annual Symposium*** **(London, United Kingdom).** Contact: 44-71-225-0303; Fax: 44-71-225-0308.
Sept. 20-23	***International Uranium Seminar '92*** (Hyatt Regency Hotel, Lake Tahoe, Nevada). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 21-23	***2nd International Conference on Training for Operation & Maintenance in the Nuclear Industry*** (The Moat House International Hotel, Stratford-upon-Avon, United Kingdom). Sponsored by the Institution of Nuclear Engineers. Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.
Sept. 29- Oct. 1	***Crisis/Emergency Information Planners' Workshop*** (Loews L'Enfant Plaza, Washington DC) Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Oct. 18-22	***AMC Mining Convention*** (Las Vegas, Nevada) Sponsored by the American Mining Congress. Contact: AMC Convention Office; 202-861-2800; Fax: 202-861-7535.
Oct. 19-23	***International Symposium on Geological Disposal of Spent Fuel, High-level and Alpha-bearing Wastes*** (Antwerp, Belgium). Sponsored by the International Atomic Energy Agency. Contact: IAEA, P.O. Box 100, A-1400 Vienna, Austria.
Nov. 15-18	***International Nuclear Energy Forum*** (Fairmont Hotel, Chicago, Illinois). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Nov. 15-20	***American Nuclear Society Winter Meeting*** (McCormick Center Hotel, Chicago, Illinois). Contact: ANS Meetings Department; 708-352-6611.

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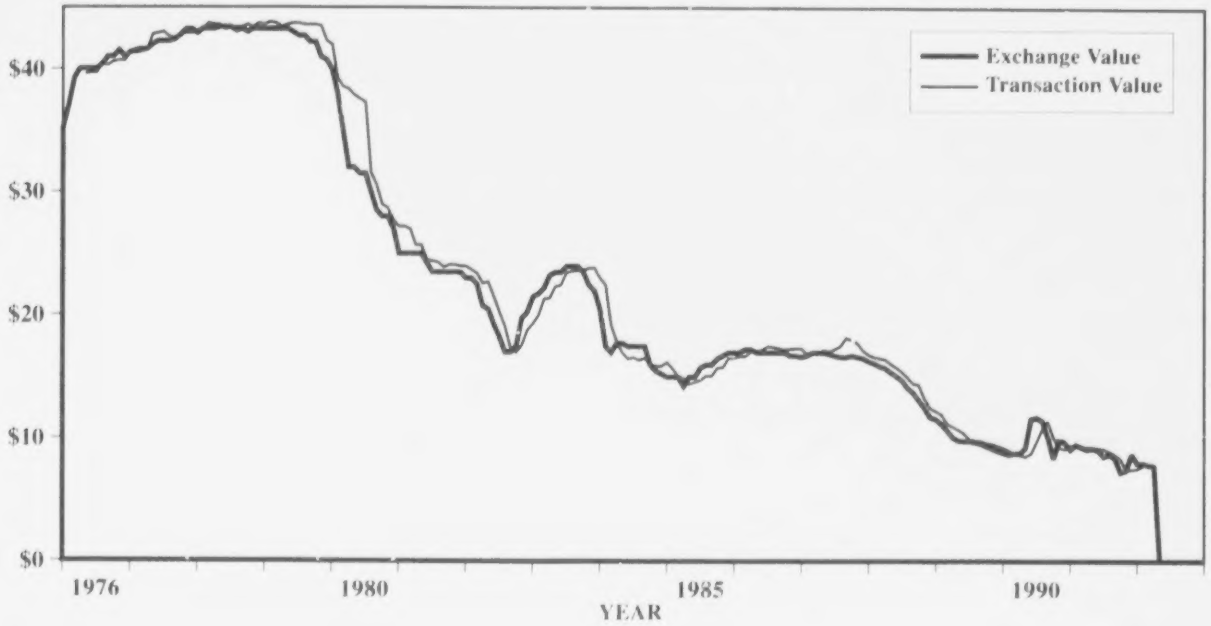
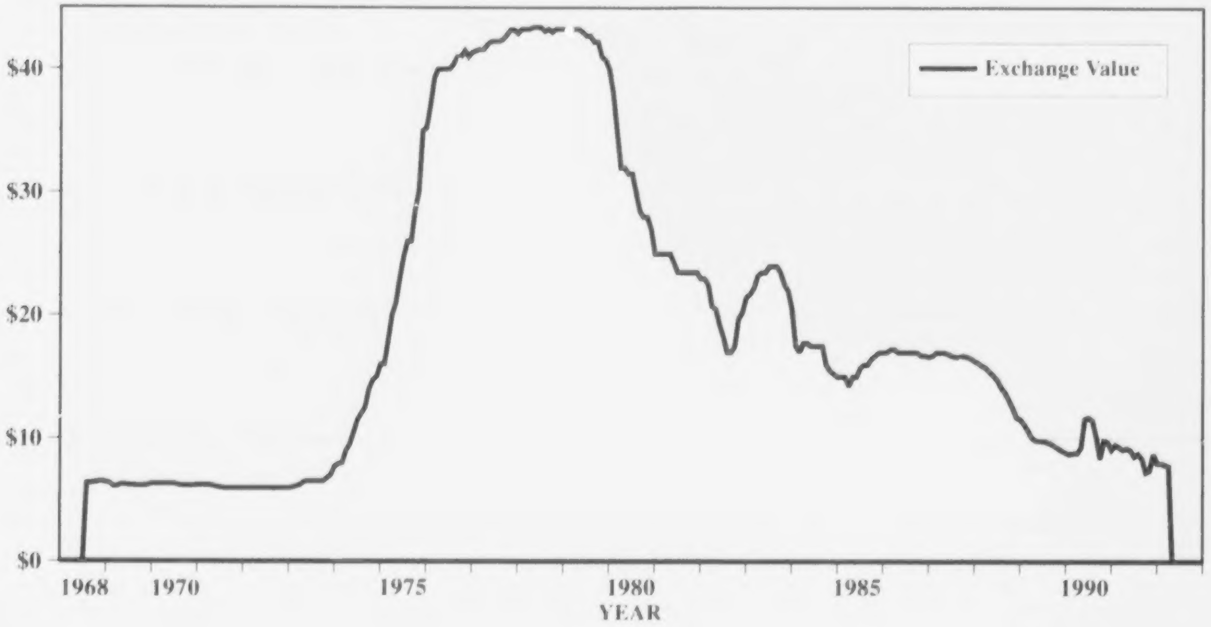
NUEXCO HISTORICAL EXCHANGE VALUE AND TRANSACTION VALUE

(in US dollars per pound U_3O_8)





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HISTORICAL MARKET VALUES

Exchange Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	9.80	9.70
1991	9.10	9.50	9.30	9.10	9.20	9.05	8.55	8.75	8.40	7.25	7.40	8.75
1992	8.00	8.00	7.85	**7.75**								

US Premium (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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HISTORICAL MARKET DATA

UF₆ Values

Determined as of the last day of the month indicated ($US/kg U as UF₆)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29.50	24.75	28.75	28.75
1991	27.50	27.75	27.50	27.25	27.60	27.25	25.75	26.25	25.50	22.75	22.75	26.00
1992	24.50	24.25	24.00	**23.75**								

US Premium (Relative to the UF₆ Value)

Determined as of the last day of the month indicated ($US/kg U as UF₆)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

Conversion Values

Determined as of the last day of the month indicated ($US/lb U as UF₆)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
1991	1.45	1.45	1.45	1.45	1.50	1.50	1.50	1.60	1.55	1.55	1.55	1.55
1992	1.60	1.60	1.60	**1.60**								

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HISTORICAL MARKET DATA

Transaction Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	9.30	9.15
1991	9.40	9.45	9.35	9.30	9.30	9.20	9.15	8.95	8.70	8.35	7.45	7.50
1992	7.55	7.80	7.95	**7.90**								

SWU Values

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	51	51
1991	51	50	52	52	54	59	66	67	67	68	68	70
1992	71	70	69	**67**								

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Loan Rates

Determined as of the last day of the month indicated (Percent per Annum)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1991	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.00
1992	3.00	3.00	3.00	**3.00**								

* Float with Prime Rate

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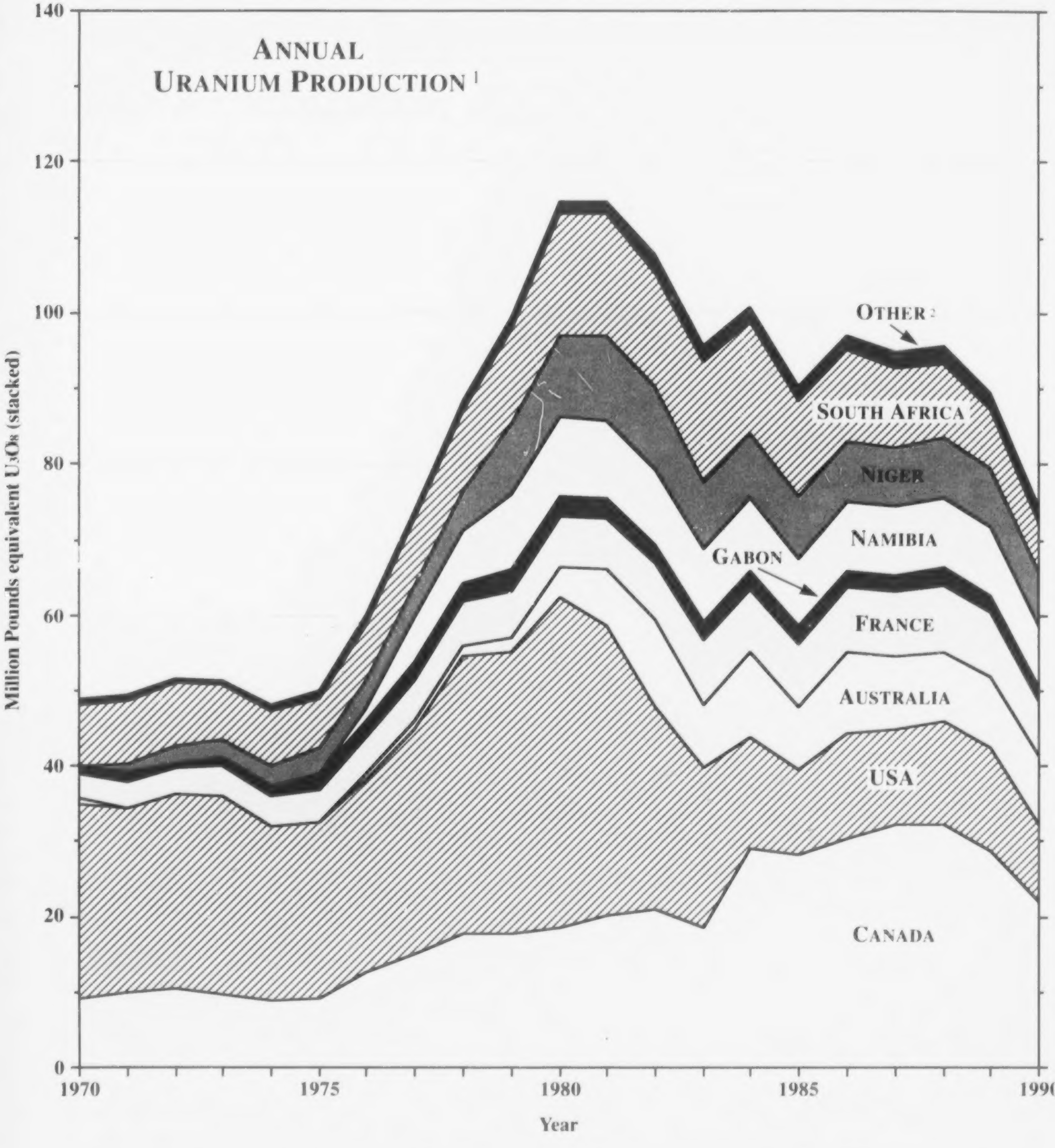

[1] Estimated western world uranium production in 1990 totalled 74.5 million pounds equivalent U_3O_8 — (Australia: 9.1 – Canada: 22.0 – France: 7.4 – Gabon: 1.8 – Namibia: 8.0 – Niger: 7.4 – South Africa: 6.4 – USA: 10.2 – Other[2]: 2.2)

[2] **Other** includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, former West Germany, and Yugoslavia (Slovenia).

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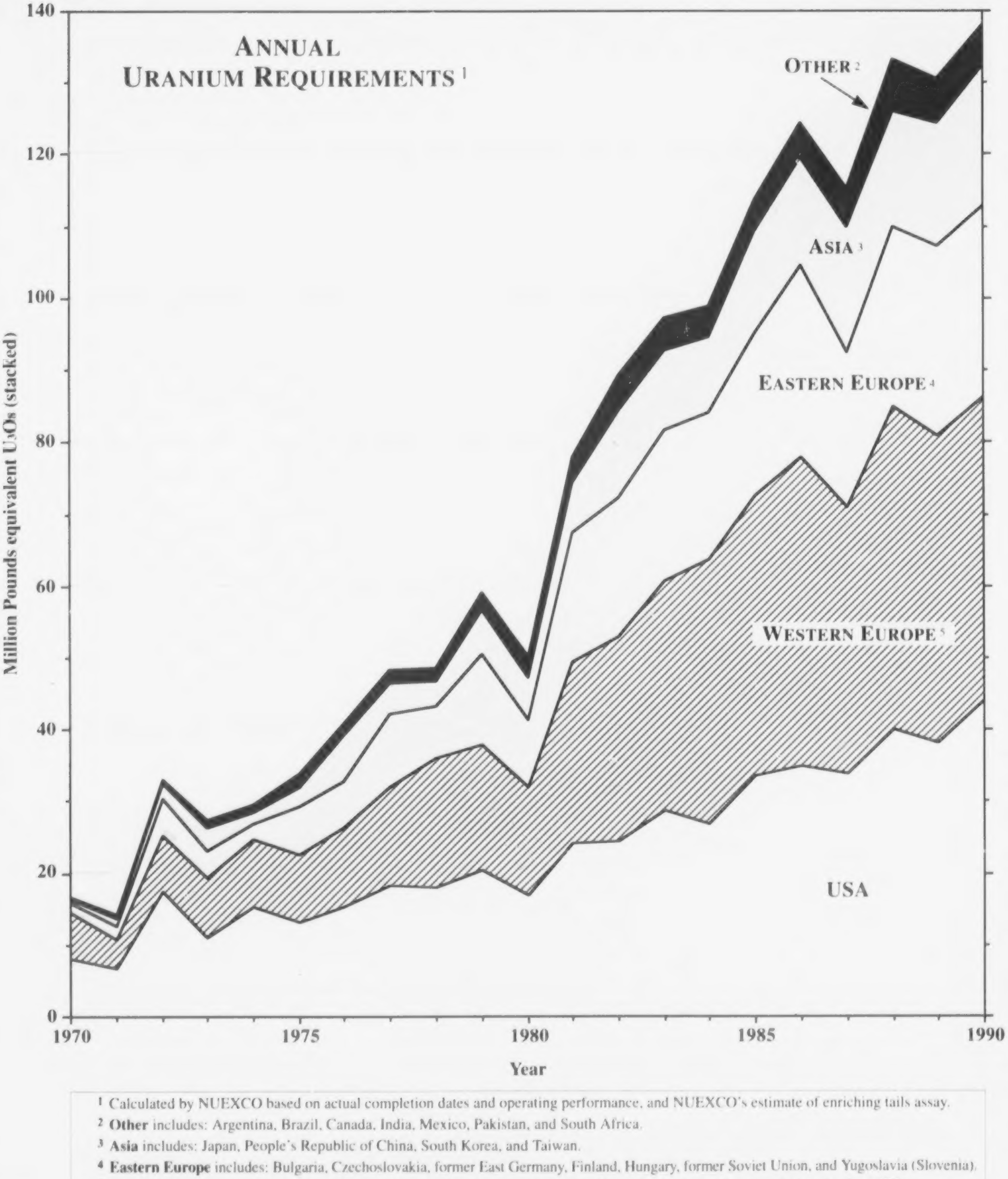

[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assay.

[2] **Other** includes: Argentina, Brazil, Canada, India, Mexico, Pakistan, and South Africa.

[3] **Asia** includes: Japan, People's Republic of China, South Korea, and Taiwan.

[4] **Eastern Europe** includes: Bulgaria, Czechoslovakia, former East Germany, Finland, Hungary, former Soviet Union, and Yugoslavia (Slovenia).

[5] **Western Europe** includes: Belgium, France, former West Germany, Italy, The Netherlands, Spain, Sweden, Switzerland, and UK.

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Australia

Year	Period[1]	Consumer Price Index[2] (1980/1981 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia[4] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[5] (June 1985 = 100)
1980	Avg.	95.8	83.1	—	69.6
1981	Avg.	105.0	85.9	—	76.1
1982	Avg.	116.7	89.0	—	86.4
1983	Avg.	128.5	96.9	—	89.9
1984	Avg.	133.6	98.0	—	96.0
1985	Avg.	142.6	107.3	—	100.0
1986	Avg.	155.5	101.5	—	104.9
1987	Avg.	168.7	108.9	465.88	112.9
1988	Avg.	180.9	111.8	496.90	115.4
1989	Avg.	194.6	117.0	534.65	126.0
1990	Avg.	208.7	123.4	571.43	129.7
1991	Avg.	215.5	120.1	600.35	133.8
Jan	1991	—	125.6	—	133.0
Feb	1991	—	121.5	597.70	133.0
Mar	1991	214.1	119.1	—	133.3
Apr	1991	—	117.6	—	133.5
May	1991	—	117.8	592.00	133.5
June	1991	214.4	120.4	—	133.5 **R**
July	1991	—	120.4	—	133.6
Aug	1991	—	119.9	599.50	133.9 **R**
Sept	1991	215.7	118.3	—	134.2 **R**
Oct	1991	—	118.7	—	134.2 **R**
Nov	1991	—	120.6	612.20	134.4 **R**
Dec	1991	217.7	121.2	—	134.4 **R**
Jan	1992	—	120.9	—	134.6
Feb	1992	—	120.9	—	—

P = Preliminary   **R** = Revised since last month

[1] Monthly data for the period 1967 to 1990 appears in NUEXCO Monthly Report 278.

[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1980 to June 1981 = 100.0). Figures shown at end of quarter represent quarterly average.

[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (CATALOGUE No. 6411.0).

[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (CATALOGUE No. 6312.0). Figures for the latest fourteen months shown are subject to revision.

[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (CATALOGUE No. 6302.0).

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Canada

				Wage-earner Data: Average Hourly Earnings (C$)[4]				
Year	**Period**	**Industrial Products Price Index: All Commodities[1] (1986 = 100)[2]**	**Consumer Price Index: All Items (1986 = 100)[3]**	**Uranium Mines (SIC 057)**	**Metal Mines (SIC 051-059)**	**Mines, Quarries and Oil Wells (SIC 051-099)**	**Metal Rolling, Casting and Extruding (SIC 298)**	**Chemicals and Chemical Products Industries (SIC 372-379)**
1980	Avg.	75.9	67.2	—.—	—.—	—.—	—.—	—.—
1981	Avg.	83.6	75.5	—.—	—.—	—.—	—.—	—.—
1982	Avg.	89.0	83.7	—.—	—.—	—.—	—.—	—.—
1983	Avg.	92.1	88.5	17.22	14.86	14.18	10.67	11.09
1984	Avg.	96.3	92.4	17.89	15.85	14.97	11.11	11.68
1985	Avg.	99.0	96.0	18.53	16.47	15.56	11.85	12.12
1986	Avg.	100.0	100.0	19.38	16.70	15.76	12.28	12.58
1987	Avg.	102.8	104.4	20.12	17.15	16.11	12.58	13.20
1988	Avg.	107.2	108.6	20.91	18.51	16.95	13.17	13.77
1989	Avg.	109.4	114.0	21.97	20.02	18.41	13.71	14.16
1990	Avg.	109.7	119.4	22.90	20.93	19.12	14.62	15.28
1991	Avg.	108.7	126.2	24.35	22.27	20.28	14.83	16.45
Jan	1991	111.1	125.0	23.79	21.79	19.78	14.66	15.89
Feb	1991	110.6	125.0	25.23	22.45	20.13	14.63	16.10
Mar	1991	109.8	125.5	24.19	22.22	20.27	15.21	16.47
Apr	1991	109.1	125.5	24.77	22.50	20.31	14.63	16.64
May	1991	108.6	126.1	24.38	22.17	20.25	15.05	16.55
June	1991	108.5	126.7	23.58	22.13	19.90	14.65	16.51
July	1991	108.2	126.8	24.70	22.33	19.93	14.56	16.36
Aug	1991	107.8	126.9	23.78	22.01	20.00	14.62	16.24
Sept	1991	107.6	126.7	24.23	22.27	20.38	14.89	16.47
Oct	1991	107.4 **R**	126.5	24.40	22.26	20.53	15.06	16.55
Nov	1991	107.3 **R**	127.0	24.58	22.44	20.79	14.85	16.62
Dec	1991	107.2 **R**	126.4	24.53	22.70	21.13	15.16	17.04
Jan	1992	107.2 **R**	127.0	24.79 **R**	22.67 **R**	21.20 **R**	15.53 **R**	16.97 **R**
Feb	1992	108.0 **R**	127.1	24.45 **P**	22.44 **P**	21.06 **P**	15.93 **P**	16.83 **P**
Mar	1992	108.3	127.5	—.—	—.—	—.—	—.—	—.—

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (CATALOGUE 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1990 is found in NUEXCO Monthly Report 278.

[2] New Base Year of 1986 as of NUEXCO Monthly Report 266. Previous Base Year was 1981.

[3] New Base Year of 1986 as of NUEXCO Monthly Report 264. Previous Base Year was 1981.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1990 is found in NUEXCO Monthly Report 278.

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South Africa

Year	Period	Average Declared Working Costs per Metric Ton of Gold Ore Milled [1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled [2] (March 1982 = 100)	Consumer Price Index [3] (1990 = 100)	Production Price Index All Groups [4] (1990 = 100)	Total Employment in Mining and Quarrying [5]	Total Salaries and Wages in Mining and Quarrying [5] (1,000 Rand)
							Annual Total [6]
1980	Avg.	35.50	—	25.5	27.7 R	709,042	2,237,689
1981	Avg.	41.87	—	29.4	31.5	722,918	2,756,928
1982	Avg.	47.23	103.9	33.7	35.9	702,041	3,181,584
1983	Avg.	51.88	115.0	37.8	39.7	700,901	3,563,282
1984	Avg.	58.95	130.3	42.2	43.0	711,511	4,134,390
1985	Avg.	68.70	151.7	49.1	50.3	724,587	4,778,612
1986	Avg.	80.18	177.9	58.2	60.1	756,637	5,767,950
1987	Avg.	95.01	223.1	67.6	68.5	751,864	6,911,395
1988	Avg.	106.69	241.1	76.2	77.5	705,355	7,774,054
1989	Avg.	116.65	273.0	87.4	89.3 R	700,360	8,833,934
1990	Avg.	129.37	305.3	100.0	100.0	677,742	10,193,209
1991	Avg.	136.06	322.4 R	115.2	111.4	630,722	10,934,073
							Monthly Total
Jan	1991	—	—	107.7	108.6	648,944	935,839
Feb	1991	—	—	109.0	109.0	650,948	893,373
Mar	1991	137.66	323.82	110.0	108.2	651,843	924,930
Apr	1991	—	—	111.5	108.8	639,939	887,722
May	1991	—	—	113.2	109.8	630,481	887,107
June	1991	134.65	317.23	114.0	110.3	640,908	890,595
July	1991	—	—	115.5	111.2	637,581	881,182
Aug	1991	—	—	117.1	112.0	633,699	963,710
Sept	1991	137.11	329.05	118.7	113.2	639,535	1,014,424
Oct	1991	—	—	119.8	114.8	584,435 R	860,529 R
Nov	1991	—	—	120.9 R	115.3	602,461	853,864
Dec	1991	134.81	319.33 R	122.5 R	115.8	602,486	940,798
Jan	1992	—	—	125.1	115.9	—	—
Feb	1992	—	—	126.2	116.3	—	—
Mar	1992	139.69	331.46	127.3	—	—	—

P = Preliminary R = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in NUEXCO Monthly Report 278.

[2] Page 16 of Report 178 contains description and calculation of index.

[3] Central Statistical Service, Pretoria: All income groups-weighted average, Historical Data by month appears in NUEXCO Monthly Report 278.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa. Base Year changed from 1985 to 1990 in NUEXCO Monthly Report 284.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in NUEXCO Monthly Report 236.

[6] Annual total is shown, rather than monthly average, for indicated year.

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GOVERNMENT STATISTICS

United States

Year	Period	Producer Price Index[1]		GNP		Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
		Industrial Commodities (1982 = 100)	All Commodities (1982 = 100)	Consumer Price Index[2] (1982-1984 = 100)	Implicit Price Deflator[3] (1987 = 100)	Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
1980	Avg.	88.0	89.8	82.4	71.7	10.26	10.63	8.31	6.94
1981	Avg.	97.4	98.0	90.9	78.9	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	83.8	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	87.2	12.58	13.43	10.58	8.66
1984	Avg.	103.3	103.7	103.9	91.0	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	94.4	13.38	13.74	11.57	9.46
1986	Avg.	100.0	100.2	109.6	96.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	100.0	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	103.9	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	108.4	13.59	13.72	13.09	10.05
1990	Avg.	115.8	116.3	130.7	112.9	14.10	14.36	13.54	10.32
1991	Avg.	116.5	116.5	136.2	117.0	14.89	14.64	14.07	10.73
Jan	1991	119.3	119.0	134.6	—	14.73	14.63	13.85	10.60
Feb	1991	117.2	117.2	134.8	—	14.80	14.55	13.81	10.59
Mar	1991	115.6	116.1	135.0	115.9	14.93	14.55	13.85	10.55
Apr	1991	115.6	116.0	135.2	—	14.85	14.56	13.96	10.63
May	1991	116.1	116.5	135.6	—	14.79	14.52	14.01	10.66
June	1991	116.1	116.4	136.0	116.8	14.88	14.51	14.05	10.74
July	1991	116.0	116.1	136.2	—	15.09	14.56	14.16	10.77
Aug	1991	116.3	116.2	136.6	—	14.82	14.64	14.06	10.78
Sept	1991	116.3	116.1	137.2	117.4	15.04	14.59	14.21	10.84
Oct	1991	116.7	116.4	137.4	—	14.94	14.75	14.25	10.78
Nov	1991	116.7	116.4	137.8	—	15.29	14.89	14.27	10.88
Dec	1991	116.1	115.9	137.9	117.9	15.13	14.87	14.34	10.96
Jan	1992	115.6	115.6	138.1	—	15.06 **R**	14.74	14.30 **R**	10.90
Feb	1992	116.0	116.1	138.6	—	15.21 **P**	14.71 **P**	14.29 **R**	10.91 **R**
Mar	1992	115.9	116.1	139.3	—	—.—	—.—	14.33 **P**	10.93 **P**

P = Preliminary **R** = Revised since last month

[1] US Bureau of Labor Statistics, Washington, DC: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents Historical data is presented in NUEXCO Monthly Report 278.

[2] US Bureau of Labor Statistics, Washington, DC: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in NUEXCO Monthly Report 278.

[3] US Department of Commerce, Washington, DC: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted. Historical data is presented in Report 278. Base Year change from 1982 to 1987 in NUEXCO Monthly Report 284.

[4] US Bureau of Labor Statistics, Washington, DC: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in NUEXCO Monthly Report 278.

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Uranium Deliveries To The European Community[1]

— Compiled from data published by the Euratom Supply Agency —

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price		Spot Contracts[3] Average Price	
			in ECU per pound U_3O_8	in US Dollars per pound U_3O_8	in ECU per pound U_3O_8	in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19
1990	12,800	16.7	ECU 23.08	$29.39	ECU 7.60	$ 9.68

P = Preliminary **R** = Revised since last month

[1] The twelve European Community member nations are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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US Uranium Marketing Data

— Compiled from data published by the US Energy Information Administration [1] —

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers [2] (million pounds U_3O_8)	Average Price of Delivered Uranium [2] (\$/lb. U_3O_8)	Quantity of Uranium Imported [3] (million pounds U_3O_8)	Average Price of Imported Uranium (\$/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	$16.10	3.6	n/a	1.2
1977	29.9	27.8	$19.75	5.6	n/a	4.0
1978	37.0	31.6	$21.60	5.2	n/a	6.8
1979	37.5	33.0	$23.85	3.0	n/a	6.2
1980	43.7	35.0	$28.15	3.6	$43.10	5.8
1981	38.5	32.6	$34.65	6.6	$32.90	4.4
1982	26.9	23.5	$38.37	17.1	$25.19	6.2
1983	21.2	24.2	$38.21	8.2	$26.16	3.3
1984	14.9	22.5	$32.65	12.5	$21.86	2.2
1985	11.3	21.7	$31.43	11.7	$20.08	5.3
1986	13.5	18.9	$30.01	13.5	$20.07	1.6
1987	13.0	20.8	$27.37	15.1	$19.14	1.0
1988	13.1	17.6	$26.15	15.8	$19.03	3.3
1989	13.8	18.4	$19.56	13.1	$16.75	2.1
1990	8.9	20.5	$15.70	23.7	$12.55	2.0

P = Preliminary **R** = Revised since last month

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity.* 1984-1990: Energy Information Administration, *Uranium Industry Annual.*

[2] Data for 1976-1981 includes both domestic utilities and agents.

[3] Includes imports by domestic utilities and domestic suppliers.

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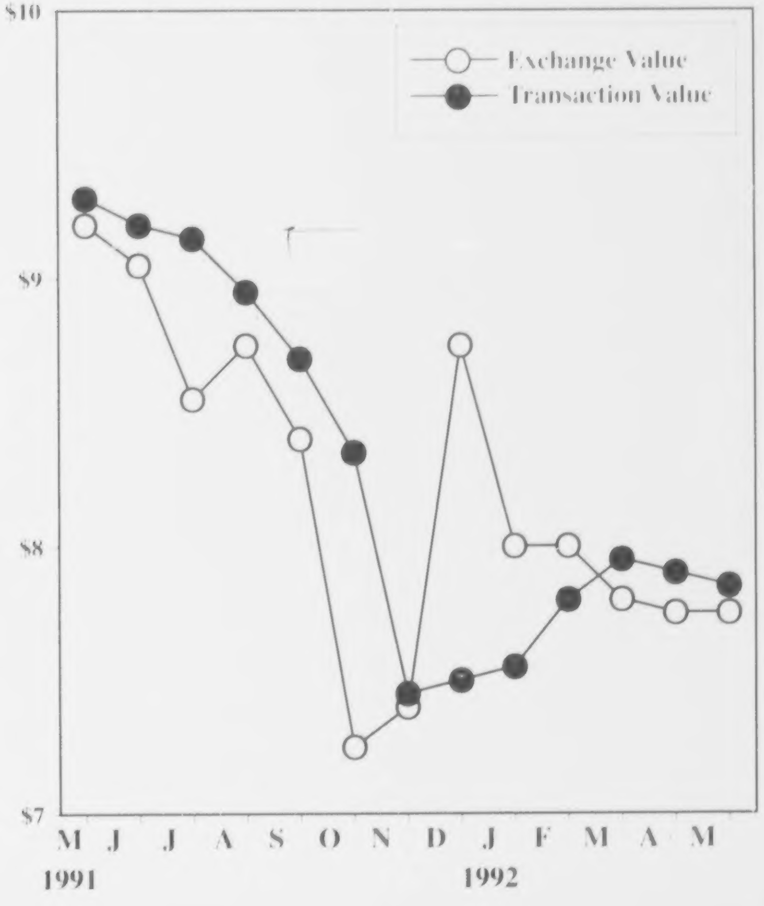

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To Our Readers

CONCORD/NUEXCO is pleased to announce the opening of a new service location in Moscow, Russia. The address of our new office is given below:

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Note that the above address should *not* be used for mail service. Please send correspondence to either our Denver or Washington D.C. offices for forwarding. This will ensure your letters or packages are received in a timely manner.

The Moscow office Director of Operations will be Mr. John R. Barter. John recently joined CONCORD from US West Inc., where he had worked since 1980, most recently as Director, Market Implementation for new services. During his tenure with US West, John held positions in finance, federal relations, marketing, and international business development. In 1990, he opened and managed US West's Moscow office and coordinated the company's business in the former Soviet Union, which included the development of a transcontinental fiber optics system and cellular telephone networks for Moscow and St. Petersburg.

CONCORD Vice Chairman Charles H. Peterson, based in Washington D.C., will continue to serve as Area Director of Operations for the Commonwealth of Independent States and other republics of the former Soviet Union. Chuck, along with a number of other CONCORD employees, travel extensively in the CIS and will use the Moscow-based staff, comprised initially of both local and expatriate personnel, in a broad range of CONCORD business activities.

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MARKET REVIEW

Market Values Summary

NUEXCO Market Values	This Report May 31, 1992	Last Report April 30, 1992	12 Months Ago May 31, 1991
EXCHANGE VALUE [1]	**$7.75** / lb equivalent U_3O_8	$7.75	$9.20
UF_6 VALUE [2]	**$23.50** / kg U as UF_6	$23.75	$27.60
LOAN RATE [3]	**3.0%** / annum	3.0%	3.5%
CONVERSION VALUE [4]	**$1.60** / lb U as UF_6	$1.60	$1.50
SWU VALUE [5] (0.3 w/o tails assay)	**$65** / SWU	$67	$54
TRANSACTION VALUE [6]	**$7.85** / lb equivalent U_3O_8	$7.90	$9.30
Transactions	**32**	22	21
Months	**3**	3	3
Millions of Pounds	**7.3**	6.2	5.3

DEFINITIONS

[1] The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

[2] The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

[3] The **Loan Rate** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

[4] The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

[5] The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

[6] The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

a) Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;
b) At least ten transactions;
c) Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.
- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.
- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight-percent (w/o) ^{235}U and a product assay of 3.0 weight-percent ^{235}U, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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MAY MARKET REVIEW

(as of May 31, 1992)

OVERVIEW

Market activity increased dramatically in May, as numerous discretionary buyers emerged. Twenty near-term transactions involving concentrates, natural UF_6, and enriched UF_6 were reported, totalling almost 6.6 million pounds equivalent U_3O_8. Prices, however, showed little strengthening, for even with the increased demand, several suppliers continued to compete aggressively. The Exchange Value was unchanged at $7.75 per pound U_3O_8, and the UF_6 Value declined slightly, to $23.60 per kgU as UF_6.

Year-to-date market volume now exceeds 17 million pounds equivalent U_3O_8 in 60 near-term transactions (**Table 1**). This is well ahead of the level of market activity at the same time in 1991 (45 transactions totalling 10.5 million pounds) and is comparable to 1990's record-volume pace (46 transactions totalling 19.1 million pounds). To date, much of 1992's volume has resulted from discretionary purchases, while demand to fill actual requirements has been relatively low. In order to sustain the current high pace of market activity, prices will have to remain low enough to motivate discretionary buying.

The Conversion Value remained unchanged at $1.60 per pound U as UF_6; five transactions totalling more than 3.8 million pounds U were reported. The Loan Rate also remained unchanged at 3.0 percent per annum, with no loans reported in May.

The SWU Value dropped two dollars, to $65 per SWU, as demand remained low compared to supply. Five SWU and enriched uranium product (EUP) sales totalling more than 200 thousand SWU were reported.

On May 29, the Department of Commerce released its preliminary determination on the anti-dumping petition filed against the former Soviet Union. The decision announced a preliminary dumping margin of 115.82 percent on uranium from the six newly independent uranium-producing republics. Due to the timing of this release, the determination had no effect on the May 31 Market Values. The final determination normally is released by the Commerce Department 75 days after the release of its preliminary determination, unless additional extensions are granted. A more detailed account of the preliminary determination and the anti-dumping petition can be found on page 14 of this Report.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	May 1992		Year-to-Date	
	No. of Sales	Volume [1]	No. of Sales	Volume [1]
Concentrates	11	4.9	36	10.0
Natural UF_6	7	1.0	14	3.7
EUP	2	0.7	10	3.3
Total [2]	**20**	**6.6**	**60**	**17.0**

[1] Million pounds equivalent U_3O_8

[2] Due to independent rounding, columns may not equal total.

NATURAL URANIUM AND CONVERSION

The May 31 **Exchange Value** remained at **$7.75** per pound U_3O_8. Early in the month, spot market prices dipped slightly, as several suppliers competed aggressively for sales. In the face of new discretionary demand in the latter half of May, prices firmed again, but an abundance of supply prevented any net price rise by month end. The Commerce Department's preliminary determination on the anti-dumping petition was not released until the end of the month, therefore the Exchange Value did not have time to reflect the market's reaction to this announcement.

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However, the results of this determination had been anticipated for weeks, and few market participants were surprised by the specific outcome. Consequently, the market impact has been minimal, and as far as can be determined, neither buyers nor sellers have altered their market plans.

Eleven concentrates sales were reported in May, totalling over 4.9 million pounds equivalent U_3O_8. Nearly all of these sales occurred at price levels at or near the May 31 Exchange Value. The total volume of concentrates sold was substantial, but more than half the total can be attributed to a large sale by a producer that occurred earlier this year. Producers, intermediaries, and utilities all bought material, with producers making at least seven of the eleven purchases. Roughly half the buyers were US-based companies, as were more than half the sellers. Sellers included intermediaries, producers, and unidentified firms.

* * *

Intense competition for limited UF_6 demand led to a $0.15 decrease in the **$UF_6$ Value**, to **$23.60** per kgU as UF_6. Supply of UF_6 is currently high, and sellers aggressively marketed these supplies during the month, resulting in UF_6 selling at an $0.18 discount from the sum of the values of its components—concentrates and conversion.

Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply[1]	Active Demand[1]
• Uranium (thousand lbs equivalent U_3O_8)	7,640	1,510
• Supply/Demand Ratio:	5.1	
• Loan (thousand lbs equivalent U_3O_8)	6,370	1,250
• Conversion (thousand lbs U as UF_6)	3,260	620
• SWU (thousand SWUs)	780	5

[1] Supply and Demand tables in the Market Review section of this Report provide details for each category.

Seven natural UF_6 sales were reported in which intermediaries sold almost one million pounds equivalent U_3O_8 at prices at or near the May 31 UF_6 Value. More than half the buyers were US utilities.

* * *

The **long-term uranium market** was active as well: five utilities and a producer purchased a total of almost 4.5 million pounds equivalent U_3O_8 in six transactions for delivery during the period 1993 through 2001. At least four of the contracts utilized base-escalated pricing terms; the others used prices related to spot market indicators.

* * *

The **Transaction Value** decreased $0.05, to **$7.85** per pound U_3O_8, based on 32 transactions over three months involving 7.3 million pounds equivalent U_3O_8. The inclusion of May's numerous lower-priced sales led to the decline.

* * *

Despite the low prices and the market's anticipation of the preliminary determination on the anti-dumping petition, **active uranium supply** increased by more than 2.5 million pounds, to **7.6** million pounds equivalent U_3O_8. **Active uranium demand** also increased, but only by 800 thousand pounds, to **1.5** million pounds equivalent U_3O_8. The **supply/demand ratio** decreased to **5.1**.

* * *

The **Loan Rate** remained unchanged at **3.0** percent per annum. No loans were reported during May.

* * *

Although the **Conversion Value** was unchanged at **$1.60** per pound U as UF_6, transaction prices occurred over a wide range. While two sales were concluded near the prevailing Conversion Value, others transpired both above and below this value. In general, prices tended to be higher in Europe and lower in the USA. Some factors that may

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have contributed to the higher European conversion prices were higher levels of demand and the fact that the most active sellers were primary converters with little excess capacity. In contrast, prices were lower in the USA, where demand was not as strong, primary converters had excess capacity, and several traders were active sellers in the market. This geographic price dichotomy between Europe and the USA is a result of the combination of these factors.

Five transactions were reported, totalling more than 3.8 million pounds U of conversion services for delivery in 1992 and 1993. Buyers were utilities and intermediaries, and sellers were primary converters and intermediaries.

ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

The **SWU Value** decreased two dollars, to **$65** per SWU, as demand for enrichment services on the secondary market remained very low relative to available supply (**Table 2**). Five enrichment transactions were reported: three utilities purchased small quantities of SWU for delivery later this year, and two other buyers made EUP purchases for third quarter delivery, containing a total of almost 700 thousand pounds equivalent U_3O_8 and more than 100 thousand SWU.

Table 3
ENRICHMENT PRICES
(May 31, 1992)

Prices	This Month Report 286	Last Month Report 285	12 Months Ago Report 274
NUEXCO SWU Value ($US per SWU)	65	67	54
US DOE SWU prices: ($US per SWU)			
USC	121.50[1]	121.50[1]	117.85[2]
AFC	153.00[3]	153.00[3]	153.00[3]
Requirements	157.00[3]	157.00[3]	157.00[3]
Incentive Price (IP2)	104.67[4]	104.67[4]	100.68[5]
Calculated worth of enriched UF_6[6]: ($US per KgU as UF_6)			
2.0 w/o ^{235}U	209	212	205
2.5 w/o ^{235}U	292	297	284
3.0 w/o ^{235}U	379	386	365
3.5 w/o ^{235}U	467	476	447
4.0 w/o ^{235}U	557	568	531
4.5 w/o ^{235}U	648	660	616

[1] Effective 10/1/91.
[2] Effective 10/1/89 to 9/30/91.
[3] Effective since 10/1/84.
[4] Provisional IP2 for FY92: Effective 10/1/91 to 9/30/92, for up to 30% of annual requirements.
[5] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.
[6] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 w/o ^{235}U tails assay.

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RECENT TRANSACTIONS

Uranium Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5399	1992	3,001-6,000	**R**	**R**	Producer	Occurred earlier in 1992
5425	1992	Less Than 50	**R**	Intermediary	Intermediary	UF_6
5427	1993-1995	1,001-3,000	See Remarks	Utility	Intermediary	Price Related to Market
5431	1992	101-300	98-102	Utility	Intermediary	UF_6
5433	1992	301-600	98-102	Utility	Intermediary	
5434	1992	101-300	98-102	Utility	Intermediary	UF_6
5436	1992	101-300	98-102	Producer	Intermediary	
5437	1992	101-300	98-102	Producer	Intermediary	
5438	1992	50-100	98-102	Producer	Intermediary	
5439	1992	Less Than 50	98-102	Producer	Intermediary	
5440	1992	101-300	98-102	Producer	**R**	
5442	1993-1996	301-600	See remarks	Utility	Intermediary	Base Escalated
5443	1992	50-100	98-102	Utility	Intermediary	UF_6
5444	1993	101-300	98-102	Utility	**R**	

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[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Exchange Value or UF_6 Value. The endpoints of each range are included within that range.

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RECENT TRANSACTIONS

Uranium Sales[1] *(continued)*

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5446	1992	101-300	98-102	Utility	Intermediary	UF_6
5447	1992	101-300	98-102	Intermediary	Intermediary	
5448A	1992	Less Than 50	See Remarks	Fabricator	Intermediary	Contained in EUP
5449	1992	Less Than 50	98-102	**R**	Intermediary	UF_6
5450	1992	101-300	98-102	Intermediary	Intermediary	UF_6
5451	1996-2000	1,001-3,000	See Remarks	Utility	Producer	Price Related to Market
5453	1992	Less Than 50	98-102	Producer	Intermediary	
5454	1992	Less Than 50	98-102	Producer	Intermediary	
5455	1993	101-300	See Remarks	Producer	Intermediary	Base Escalated
5457	1993-2001	1,001-3,000	See Remarks	Utility	Intermediary	UF_6 – Base Escalated
5458	1993-2001	301-600	See Remarks	Utility	Intermediary	Base Escalated
5461A	1992	601-1,000	See Remarks	Utility	Intermediary	Contained in EUP

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RECENT TRANSACTIONS

Natural Uranium Loans[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Loan Rate	Borrower	Lender	Remarks
No Natural Uranium Loans are reported						

Conversion Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range[2] of Current Conversion Value	Buyer	Seller	Remarks
5428	1992	50-100	98-102	Utility	**R**	
5445	1992	301-600	98-102	Intermediary	Intermediary	
5452	1992	301-600	Above 110	Intermediary	Converter	
5456	1992-1993	1,001-3,000	Above 110	Intermediary	Converter	
5460	1992	101-300	Below 90	Utility	**R**	

Enrichment Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity[3] (thousand SWU)	Price Within Percentage Range[2] of Current SWU Value[4]	Buyer	Seller	Remarks
5432	1992	Less Than 50	98-102	Utility	Intermediary	
5435	1992	Less Than 50	103-110	Utility	Intermediary	
5448B	1992	Less Than 50	See Remarks	Fabricator	Intermediary	Contained in EUP
5459	1992	Less Than 50	98-102	Utility	**R**	
5461B	1992	101-300	See Remarks	Utility	Intermediary	Contained in EUP

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[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., X dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

Uranium Supply

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Quantity (Thousand Pounds equivalent U_3O_8) Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1505*	1,250	—	1992	
91-1507	500	—	1992	
91-1511*	1,825	—	1992	UF_6/UF_6e
91-1512*	1,050	—	1992	UF_6
92-1128*	1,170	—	1992	
92-1160*	700	—	1992	
92-1501A	645	—	1992	UF_6e
92-1509	500	—	1992	UF_6
91-1268	—	600 per year	1992-1999	
92-1129*	—	465 per year	1993-1999	
TOTAL	**7,640**			
INACTIVE	**2,805**			
AVAILABLE TO LOAN:				
ACTIVE				
92-1072	1,600	—	1992	UF_6
92-1074	1,000	—	1992	
92-1075	500	—	1992	
92-1077	180	—	1992	UF_6
92-1114	390	—	1992	UF_6
92-1161*	700	—	1992	
92-1503	2,000	—	1992	
TOTAL	**6,370**			
INACTIVE	**1,600**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 92-1008, 92-1119

Active Projects removed since last month: 91-1506

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SUPPLY AND DEMAND

Uranium Demand

	Quantity (Thousand Pounds equivalent U_3O_8)			
NUEXCO Project Number	Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
INQUIRIES TO PURCHASE:				
ACTIVE				
92-1127*	25	—	1992	U_3O_8/UF_6
92-1140*	200	—	1992	
92-1144*	390	—	1992	U_3O_8/UF_6
92-1152A*	15	—	1993	UF_6c
92-1153*	500	—	1992	U_3O_8/UF_6
92-1158*	380	—	1992	
91-1184	—	350 per year	1993-1997	
91-1197	—	2,210	1992-1997	U_3O_8/UF_6
91-1267*	—	915	1993	UF_6
91-1290	—	310 per year	1995-1999	U_3O_8/UF_6
92-1015	—	1,300 per year	1995-2004	
92-1032	—	200 per year	1996-1998	U_3O_8/UF_6
TOTAL	**1,510**			
INACTIVE	**1,560**			
INQUIRIES TO BORROW:				
ACTIVE				
92-1505	500	—	1992	
92-1511*	750	—	1992	
TOTAL	**1,250**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: 91-1283, 91-1294, 92-1064, 92-1110, 92-1113, 92-1120

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SUPPLY AND DEMAND

Conversion Supply and Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF_6)		Delivery Period	Remarks
	Within 3 Years[1]	Beyond 3 Years[2]		
AVAILABLE FOR SALE:				
ACTIVE				
91-1500*	400	—	1992	
91-1501	1,100	—	1992	
92-1154*	660	—	1992	
92-1507	1,100	—	1992	
TOTAL	**3,260**			
INACTIVE	*None reported*			
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1275*	620	—	1992-1993	
TOTAL	**620**			
INACTIVE	**130**			

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: 92-1068, 92-1107, 92-1111, 92-1508

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SUPPLY AND DEMAND

SWU Supply and Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1509	200	—	1992	
91-1515	200	—	1992	
92-1501B	130	—	1992	UF_6e
92-1124*	250	250 per year	1992-1994	
TOTAL	**780**			
INACTIVE	*None reported*			
INQUIRIES TO PURCHASE:				
ACTIVE				
ACTIVE				
92-1152B*	5	—	1993	UF_6e
90-1196	—	60 per year	1995 on	
91-1152	—	2,700	1995-2001	
92-1016	—	170 per year	1996-2006	
TOTAL	5			
INACTIVE	**140**			—

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 91-1142

Active Projects removed since last month: 91-1171, 91-1250, 92-1024, 92-1058, 92-1079, 92-1096B

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NUEXCO

MARKET VALUES EXPRESSED IN SELECTED CURRENCIES[1]

Australia *to* **Hungary**	**Australia** (dollar)	**Belgium** (franc)	**Canada** (dollar)	**China** (renminbi)	**CSFR** (koruna)	**EC** (ecu)	**Finland** (markka)	**France** (franc)	**Germany** (mark)	**Hungary** (forint)
EXCHANGE VALUE										
per pound equivalent U_3O_8 as Concentrates										
This Month (May 31, 1992)	**10.24**	**256.28**	**9.32**	**42.59**	**221.73**	**6.06**	**33.81**	**41.79**	**12.46**	**610.08**
Last Month (Apr 30, 1992)	10.23	262.98	9.24	42.77	219.94	6.23	34.75	43.11	12.78	610.16
12 Months Ago (May 31, 1991)	12.09	329.63	10.53	48.88	—.—	7.72	38.11	54.40	16.03	—.—
per kg U as Concentrates										
This Month (May 31, 1992)	**26.61**	**666.28**	**24.23**	**110.71**	**576.44**	**15.76**	**87.89**	**108.66**	**32.39**	**1,586**
Last Month (Apr 30, 1992)	26.61	683.69	24.02	111.20	571.81	16.20	90.36	112.08	33.23	1,586
12 Months Ago (May 31 1991)	31.43	856.97	27.38	127.06	—.—	20.06	99.07	141.43	41.66	—.—
UF_6 VALUE										
per kg U as UF_6										
This Month (May 31, 1992)	**31.17**	**780.42**	**28.38**	**129.68**	**675.20**	**18.46**	**102.94**	**127.27**	**37.94**	**1,858**
Last Month (Apr 30, 1992)	31.36	805.90	28.32	131.08	674.02	19.09	106.51	132.12	39.17	1,870
12 Months Ago (May 31, 1991)	36.27	988.89	31.59	146.63	—.—	23.15	114.32	163.20	48.08	—.—
TRANSACTION VALUE										
per pound equivalent U_3O_8 as Concentrates										
This Month (May 31, 1992)	**10.37**	**259.59**	**9.44**	**43.14**	**224.59**	**6.14**	**34.24**	**42.33**	**12.62**	**617.95**
Last Month (Apr 30, 1992)	10.43	268.07	9.42	43.60	224.20	6.35	35.43	43.95	13.03	621.97
12 Months Ago (May 31, 1991)	12.22	333.21	10.64	49.41	—.—	7.80	38.52	54.99	16.20	—.—
per kg U as Concentrates										
This Month (May 31, 1992)	**26.95**	**674.88**	**24.54**	**112.14**	**583.88**	**15.96**	**89.02**	**110.06**	**32.81**	**1,607**
Last Month (Apr 30, 1992)	27.12	696.92	24.49	113.35	582.88	16.51	92.10	114.25	33.87	1,617
12 Months Ago (May 31, 1991)	31.77	866.28	27.67	128.45	—.—	20.28	100.14	142.96	42.11	—.—
CONVERSION VALUE										
per pound U as UF_6										
This Month (May 31, 1992)	**2.11**	**52.91**	**1.92**	**8.79**	**45.78**	**1.25**	**6.98**	**8.63**	**2.57**	**125.95**
Last Month (Apr 30, 1992)	2.11	54.29	1.91	8.83	45.41	1.29	7.18	8.90	2.64	125.97
12 Months Ago (May 31, 1991)	1.97	53.74	1.72	7.97	—.—	1.26	6.21	8.87	2.61	—.—
per kg U as UF_6										
This Month (May 31, 1992)	**4.66**	**116.65**	**4.24**	**19.38**	**100.92**	**2.76**	**15.39**	**19.02**	**5.67**	**277.68**
Last Month (Apr 30, 1992)	4.66	119.69	4.21	19.47	100.11	2.84	15.82	19.62	5.82	277.71
12 Months Ago (May 31, 1991)	4.35	118.49	3.78	17.57	—.—	2.77	13.70	19.55	5.76	—.—
SWU VALUE										
per SWU at 0.30 w/o ^{235}U Tails Assay										
This Month (May 31, 1992)	**85.84**	**2,149**	**78.17**	**357.17**	**1,860**	**50.83**	**283.53**	**350.54**	**104.48**	**5,117**
Last Month (Apr 30, 1992)	88.47	2,274	79.89	369.77	1,901	53.85	300.46	372.72	110.49	5,275
12 Months Ago (May 31, 1991)	70.96	1,935	61.81	286.88	—.—	45.28	223.49	319.30	94.06	—.—

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[1] Calculated using currency exchange rates for the last business day of the month, as published in *The Wall Street Journal*.

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES[1]

Italy *to* United States	Italy (lira)	Japan (yen)	Netherlands (guilder)	S. Africa (comm. rand)	S. Korea (won)	Spain (peseta)	Sweden (krona)	Switzerland (franc)	Taiwan (dollar)	UK (pound)	USA (dollar)
EXCHANGE VALUE											
per pound equivalent U_3O_8 as Concentrates											
This Month (May 31, 1992)	**9,381**	**989.28**	**14.03**	**21.94**	**6,194**	**776.79**	**44.88**	**11.29**	**190.89**	**4.24**	**7.75**
Last Month (Apr 30, 1992)	9,607	1,033	14.38	22.28	6,159	801.70	46.13	11.72	193.35	4.36	7.75
12 Months Ago (May 31, 1991)	11,891	1,272	18.06	25.92	6,664	992.23	57.46	13.65	247.48	5.42	9.20
per kg U as Concentrates											
This Month (May 31, 1992)	**24,390**	**2,572**	**36.47**	**57.03**	**16,102**	**2,019**	**116.67**	**29.35**	**496.28**	**11.01**	**20.15**
Last Month (Apr 30, 1992)	24,976	2,685	37.37	57.93	16,011	2,084	119.93	30.46	502.66	11.34	20.15
12 Months Ago (May 31, 1991)	30,914	3,307	46.96	67.37	17,326	2,580	149.39	35.48	643.39	14.09	23.92
UF_6 VALUE											
per kg U as UF_6											
This Month (May 31, 1992)	**28,568**	**3,013**	**42.72**	**66.80**	**18,860**	**2,365**	**136.65**	**34.37**	**581.30**	**12.90**	**23.60**
Last Month (Apr 30, 1992)	29,441	3,165	44.05	68.29	18,873	2,457	141.37	35.91	592.52	13.37	23.75
12 Months Ago (May 31, 1991)	35,673	3,816	54.19	77.75	19,993	2,977	172.39	40.94	742.43	16.25	27.60
TRANSACTION VALUE											
per pound equivalent U_3O_8 as Concentrates											
This Month (May 31, 1992)	**9,502**	**1,002**	**14.21**	**22.22**	**6,273**	**786.81**	**45.45**	**11.43**	**193.35**	**4.29**	**7.85**
Last Month (Apr 30, 1992)	9,793	1,053	14.65	22.71	6,278	817.21	47.02	11.94	197.09	4.45	7.90
12 Months Ago (May 31, 1991)	12,020	1,286	18.26	26.20	6,737	1,003	58.09	13.80	250.17	5.48	9.30
per kg U as Concentrates											
This Month (May 31, 1992)	**24,704**	**2,605**	**36.94**	**57.76**	**16,310**	**2,046**	**118.17**	**29.72**	**502.68**	**11.16**	**20.41**
Last Month (Apr 30, 1992)	25,460	2,737	38.10	59.05	16,321	2,125	122.25	31.05	512.39	11.56	20.54
12 Months Ago (May 31, 1991)	31,250	3,343	47.47	68.11	17,514	2,608	151.02	35.87	650.38	14.24	24.18
CONVERSION VALUE											
per pound U as UF_6											
This Month (May 31, 1992)	**1,937**	**204.24**	**2.90**	**4.53**	**1,279**	**160.37**	**9.26**	**2.33**	**39.41**	**0.87**	**1.60**
Last Month (Apr 30, 1992)	1,983	213.19	2.97	4.60	1,271	165.51	9.52	2.42	39.92	0.90	1.60
12 Months Ago (May 31, 1991)	1,939	207.38	2.95	4.23	1,087	161.78	9.37	2.23	40.35	0.88	1.50
per kg U as UF_6											
This Month (May 31, 1992)	**4,270**	**450.27**	**6.39**	**9.98**	**2,819**	**353.55**	**20.42**	**5.14**	**86.88**	**1.93**	**3.53**
Last Month (Apr 30, 1992)	4,373	470.01	6.54	10.14	2,803	364.89	21.00	5.33	88.00	1.99	3.53
12 Months Ago (May 31, 1991)	4,274	457.20	6.49	9.32	2,395	356.66	20.66	4.91	88.96	1.95	3.31
SWU VALUE											
per SWU at 0.30 w/o ^{235}U Tails Assay											
This Month (May 31, 1992)	**78,683**	**8,297**	**117.67**	**183.98**	**51,946**	**6,515**	**376.38**	**94.67**	**1,601**	**35.53**	**65.00**
Last Month (Apr 30, 1992)	83,054	8,927	124.28	192.64	53,242	6,931	398.81	101.30	1,672	37.72	67.00
12 Months Ago (May 31, 1991)	69,794	7,466	106.03	152.11	39,116	5,824	337.29	80.11	1,453	31.80	54.00

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[1] Calculated using currency exchange rates for the last business day of the month, as published in *The Wall Street Journal*.

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RECENT DEVELOPMENTS

USA

On May 29, the Department of Commerce (DOC) issued a preliminary determination in its anti-dumping investigation regarding uranium from the former Soviet Union. Based on data submitted by the petitioners and disregarding data submitted by the respondents—including Techsnabexport, Global Nuclear Services and Supply Ltd., and NUEXCO—DOC determined that the countries of Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Ukraine, and Uzbekistan had sold uranium in the USA at less than fair value, and accordingly, estimated a preliminary dumping margin of 115.82 percent. The Department also found that the six other former republics have not produced, exported, or stockpiled any uranium and therefore may be excused from the petition.

Under the special procedures applicable to non-market economies, the Commerce Department constructed a foreign market value (FMV) for the estimation of uranium production costs, based on a surrogate country analysis using Portugese electricity costs, Namibian labor costs, and average Canadian mining efficiency. Enrichment costs were estimated using the operating costs of British Nuclear Fuels plc and Portugese electricity costs. DOC calculated that the FMV of uranium was US$26.31 per pound U_3O_8 and that the FMV for EUP was US$1,256.43 per kgU (based on a US$141 per SWU enrichment cost). These costs were compared to an arbitrary average US value, and then averaged together to determine the artificially precise preliminary dumping margin of 115.82 percent.

The petition now enters a two-phased process, with DOC continuing toward its final determination now scheduled for August 11, and the International Trade Commission (ITC) beginning the second phase of its investigation into whether the domestic industry has been injured. DOC has scheduled a public hearing for August 3; ITC is scheduled to make its final ruling 45 days after the final DOC ruling. Only if ITC makes an affirmative final determination that the domestic industry has been injured will DOC issue an anti-dumping duty order. The timeline in the following table shows the historical and projected dates of key events of the investigation.

In April, Techsnabexport and the republics of Ukraine and Tajikistan sought a preliminary injunction from the Court of International Trade to end the investigation. While the Court did not grant the preliminary injunction, the Court did retain jurisdiction, thus indicating its willingness to continue the examination of the legality of the Commerce Department's decision. The Court will be receiving briefs from all interested parties in June and July. If the Court agrees that the continuation of the DOC investigation is illegal, the Court could order that the case be terminated.

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Anti-Dumping Petition Timeline

1991	
November 8	The Ad Hoc Committee of Domestic Uranium Producers, which consists of eleven mining and milling companies, and the Oil, Chemical and Atomic Workers International Union, filed a petition on behalf of the US uranium industry, claiming injury from imports of Soviet uranium.
December 23	The International Trade Commission, based on its preliminary investigation, annouced its decision "that there is a reasonable indication" that the US uranium industry is being materially injured by imports of uranium from the Soviet Union that "allegedly are sold at less than fair value".
1992	
March 25	Despite the request by some respondents that the proceeding be terminated as the result of the dissolution of the Soviet Union, the Commerce Department determined that the investigation should continue against the republics of the former Soviet Union.
April 9 & 13	Before the Court of International Trade, Ukraine, Tajikistan, and Techsnabexport sought to enjoin the continuation of the DOC investigation on the grounds that the dissolution of the Soviet Union rendered the petition invalidly filed. They also requested that the Court terminate the investigation. (The Russian Federation filed a similar action on June 9.)
May 25	The Court did not terminate the investigation as requested by the republics, but retained jurisdiction.
May 29	The Commerce Department issued its preliminary determination that uranium had been sold at less than fair value by Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Ukraine, and Uzbekistan. The result of the findings is an estimated dumping duty of 115.82 percent to be deposited on uranium imported from the republics. The Commerce Department determined that no sales at less than fair value had been made by Armenia, Azerbaijan, Byelarus, Georgia, Moldova, and Turkmenistan, republics which produce no uranium.
August 3	Interested parties may comment at a public hearing on the Commerce Department's preliminary determination.
August 11	The Commerce Department is scheduled to issue its final determination, but the date can be extended up to 60 days (October 9). If the final determination of the Commerce Department is affirmative, the International Trade Commission will have 45 days to decide whether the imports have materially injured or threaten injury to the US uranium industry. If the International Trade Commission in its final determination finds injury or threat of injury, the Commerce Department will issue an order instructing the US Customs Service to collect the anti-dumping duties.

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WASHINGTON FOCUS

by Linda L. Gunter

On May 27, the House of Representatives approved the Comprehensive National Energy Policy bill HR 776 by a vote of 381-37. With titles on improving energy efficiency and conservation, filling the strategic petroleum reserve, as well as important support for nuclear licensing reform, uranium enrichment restructuring, low-level waste deregulation, and allowing the Department of Energy (DOE) to move forward on Yucca Mountain spent fuel repository characterization, this major legislation will, if enacted, go a long way toward creating an energy policy for the USA.

Rules Committee Hearing

◇ The House Rules Committee heard more than 50 congressmen on May 19, to determine how the full House would consider the Energy bill. Nine committees had jurisdiction over some or all of the bill, and it was the Rules Committee's job to determine what text would be considered by the full House and how many amendments would be allowed. Eventually it was determined that the Energy & Commerce committee had the most jurisdiction, followed by the Interior Committee. Consequently, the base text was mostly the version of HR 776 marked up by the Energy & Commerce committee, with some titles of the bill (such as nuclear provisions) adopted from other committees because of negotiations between Energy & Commerce Committee chairman John Dingell (D-MI) and the other respective committee chairs.

Enrichment Title

◇ The Rules Committee's determination was very important for the enrichment title of the energy bill because four committees (Energy & Commerce; Interior; Science, Space & Technology; and Ways & Means) had joint jurisdiction. The most controversial aspect of the enrichment section of the bill was the funding of decontamination and decommissioning (D&D). Ultimately a compromise was reached, whereby the Energy & Commerce version of enrichment restructuring was melded with the Interior version, but included some aspects of the Ways & Means Committee language on D&D. A side-by-side comparison of the Senate and the House versions follow.

The consensus seems to be that the enrichment bill as passed by the House will not create a competitive corporation. Because this version is substantially different from the Senate version, which has not had close scrutiny for two years, current thinking among Washington lobbyists is that the entire title will have to be rewritten in the joint House-Senate conference committee, which is expected to begin its work in late June to reconcile the differences between the two versions.

Energy Bill Nuclear Provisions

◇ The Energy bill includes other areas of interest to the nuclear industry. By a vote of 254-160, the House passed the Clement/Barton amendment, which ensures nuclear licensing reform and thereby facilitates the industry activities surrounding the next nuclear plant order. The language endorses the Nuclear Regulatory Commission's regulatory changes made last year that deter intervenors from forcing a second public hearing prior to start of the completed reactor. The House also passed, by voice vote, a title allowing DOE to move forward with characterization of the spent fuel repository at Yucca Mountain, despite the state of Nevada's lack of cooperation.

One area of concern to uranium mining companies is an amendment offered by Rep. Robert Matsui (D-CA) during the Ways & Means Committee markup,

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which provides a tax credit for wind and solar companies, while removing the tax depreciation allowance from uranium, lead, mercury, and asbestos companies. Rep. Matsui's amendment was accepted as original text for purposes of House consideration of the bill. Although the Senate bill does not have this language, tax provisions constitutionally must originate in the House and therefore the House conferees (in a House-Senate conference) will have greater say about whether this provision is retained. Reps. Phil Sharp (D-IN) and John Dingell could have helped the uranium industry remove these provisions; however, their unwillingness to do so was caused by their dismay at the neutral position of the Uranium Producers of America on the uranium enrichment restructuring title.

Comparison of Uranium Enrichment Restructuring Legislation

Senate Bill S 2166	*House Bill HR 776*
I. GOVERNMENT CORPORATION	
United States Enrichment Corporation (USEC) **Capital Structure:** • Production facilities, except Oak Ridge*, inventory, and patents transfer to the Corporation. Liabilities chargeable to transferred unexpended balances of appropriations become liabilities of Corporation. • Capital stock wholly owned by US equal to book value of assets transferred to Corporation. Dividends on Capital stock payable to Treasury unless there is an overriding need to retain earnings. • $364 million initial debt payable within 20 years. • Capital stock and initial debt constitute sole recovery of previously unrecovered costs. • Authorized to issue $2.5 billion in public debt, pledged by revenues. Not guaranteed by US government and no Federal Financing Bank borrowing.	***Uranium Enrichment Corporation*** **Capital Structure:** • Current contracts transfer to Corporation. May lease GDPs, but not HEU facilities. Privatization process is different: OMB, through secret minimum bid, offers assets for sale in competitive bidding situation. • Can issue bonds but cannot use money to construct an enrichment facility. Bonds are not guaranteed by the US government. • $364 million is loaned to the Corporation from the existing Uranium Enrichment Special Account, and must be repaid with interest within 20 years. All other money in the Special Fund is transferred to Treasury.
Environmental/Occupational Safety Laws: • Four years after enactment, USEC subject to federal environmental laws and OSHA, to the same extent as private corporations.	**Environmental/Occupational Safety Laws:** • USEC subject to federal, state, interstate, and local environmental laws, and OSHA, to the same extent as private corporations.
Management/Board of Directors: • Five members appointed by the President, with the advice and consent of the Senate, for five-year terms, with one member a former electric utility manager. • Corporation managed by an administrator appointed by the President and approved by the Senate. • Annual performance report to Administrator (CEO) and Congress.	**Management/Board of Directors:** • Similar, except board has eleven members. • Conflict of interest provision precludes utilities from membership. • Corporation managed by administrator appointed by Board.

* In S 210, Oak Ridge transfers after 2000 when government decides it can be decommissioned.

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Comparison of Uranium Enrichment Restructuring Legislation *(continued)*

Senate Bill S 2166	***House Bill HR 776***
Pricing: • Commercial pricing set to recover costs over the long term, repay initial debt, recover commercial share of D&D and remedial actions, and generate profit. • Government pricing set annually to recover costs including depreciation, government share of D&D, and remedial actions, but excluding repayment of the initial debt and profit. Government pricing for LEU shall not exceed the average base charge paid by commercial customers.	**Pricing:** • Prices charged to DOE shall recover costs on a yearly basis for providing products, materials and services. The prices are intended to cover depreciation, interest, D&D, and reasonable profits. No specific language about pricing to commercial customer.
Federal Tax Status: • No state or local taxes; payments in lieu of state and local taxes in a comparable amount to similar private industries, excluding any amount that private industry would pay as a tax on net income. • Bill is silent on federal taxation.	**Federal Tax Status:** • No federal taxes; state or local payments in lieu of taxes in comparable amount to similar private industries. • Payments do not begin until 1998.
NRC Licensing Requirements: • Corporation initially exempt from NRC licensing with respect to existing GDPs; NRC to promulgate regulations within 2 years; Corporation must apply for license within one year. Bill is silent on licensing for new facilities and for R&D.	**NRC Licensing Requirements:** • AVLIS can be licensed under production and utilization regulations. Operation of GDPs must be regulated by NRC in consultation with EPA and DOE. If the Corporation leases the GDPs, NRC must establish certification process so the Corporation is in compliance with regulation.
II. DECONTAMINATION AND DECOMMISSIONING	
• For LEU, the cost for D&D to be recovered from commercial customers is a ratio of the amount of SWU purchased by the customers to the total amount produced over the life of the property.	• D&D fund of $500 million/year created for DOE's enrichment facilities. The money is to come from the following: – An annual fee assessed on utilities, based on the ratio of SWU purchased by each utility to the total SWU produced by DOE. – Government appropriations. The total utility liability is capped at $2.5 billion or 15 years, whichever comes first. Cost of environmental remediation stays with DOE.
III. AVLIS	
• Secretary authorized to grant to Corporation the rights and access to AVLIS technology. • Secretary to provide, on a reimbursable basis, the necessary cooperation and support to assure the commercial development and deployment of AVLIS.	• AVLIS is transferred to the Corporation under royalty arrangement. • Corporation cannot construct a commercial-scale AVLIS facility until after privatization begins. • DOE is to be reimbursed for any future R&D on AVLIS. Corporation cannot grant license for patent use.

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Comparison of Uranium Enrichment Restructuring Legislation *(continued)*

Senate Bill S 2166	*House Bill HR 776*
IV. URANIUM REVITALIZATION	
• Establishes voluntary overfeeding program. • Establishes national strategic reserve of 50 million kgU. • Enrichment of DOE's tails is restricted to military purposes. • Gives DOE Secretary continuing responsibility for the domestic mining industry. Secretary should encourage exports of domestic uranium. • Requires an ITC investigation of imports of uranium and enriched uranium from non-market countries and a report within one year of enactment of this bill. • Authorizes the Corporation to purchase rather than produce enriched uranium as long as the prices are below its cost of production. • If enriched uranium is purchased, requires feed provided by customer to be retained in inventory or used for overfeeding.	• Requires yearly reports to the Energy Information Administration from utilities. Reports will provide country of origin and seller of uranium or enriched uranium imported into the USA. • All uranium inventories associated with current contract requirements transfer to Corporation. Remainder of uranium inventories held by DOE should be sold at fair market prices. • Requires report on conversion of HEU.
V. MILL TAILINGS CLEANUP	
• $300 million in government funds indexed to inflation.	• Establishes $310 million fund indexed for inflation. $40 million of the fund goes to thorium sites. Source of the funds is D&D fund. DOE must issue regulations, and fund is subject to annual appropriations.
VI. MISCELLANEOUS	
• Repeal of Sec. 161v and 170B of the Atomic Energy Act.	• Section 161v specifically not repealed. Encourages full cost recovery.
• Silent	• Grants the National Taxpayers Union standing to sue to enforce the "purposes" of the Act.
• Silent	• Authorizes the Corporation to enter transactions regarding uranium, enriched uranium, or depleted uranium. Shall act as exclusive marketing agent for US government for entering into contracts for enrichment services.
• Silent	• Current employees are protected: they retain status as government employees. Corporation must abide by union agreement signed 4/30/91 which protects jobs, wages, and benefits.

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INDUSTRY BRIEFS

South Korea To Build New Fabrication Plant

Korea Nuclear Fuel Company (KNFC) announced in May it plans to build a new fuel fabrication plant at Kongju. The plant, located approximately 170 km from Seoul, will have a capacity of 200 MTU per year for PWR fuel and 400 MTU per year for HWR fuel. The Kongju plant, when combined with the capability of KNFC's other fabrication plant at Taejon, will enable South Korea to manufacture enough fuel to meet the needs of the country's nine existing nuclear reactors. The country has plans to complete eighteen new reactors by the year 2006, of which five are under construction. The new fabrication plant has a projected cost of US$140 million and is expected to begin operation in 1997.

◆ ◆ ◆

Utilities Form E-7 Group

The world's seven largest utilities have formed a group, known as "E-7", to provide a forum for information exchange and cooperation, and to act as a lobbying group for international electricity issues. The members of E-7 include: Electricité de France, Enel of Italy, Ontario Hydro and Hydro Quebec of Canada, Tokyo Electric Power Company and Kansai Electric Power Company of Japan, and RWE of Germany.

Electrabel to Use MOX Fuel

The Belgian utility Electrabel submitted an application on May 18 to load mixed-oxide (MOX) fuel into its 900-MWe PWRs, Doel 3 and Tihange 2. If this request to proceed with the recycling is approved by government authorities, Belgium will join France, Germany, Switzerland, and Japan as countries pursuing commercial fuel recycling. The MOX fuel for the plants will be fabricated by Belgonucleaire at its plant in Dessel.

◆ ◆ ◆

Energy Fuels To Purchase Reno Creek

Energy Fuels Exploration Company announced May 22 that it had signed an agreement with Union Pacific Resources (UPR) to purchase UPR's Reno Creek uranium properties in Wyoming. This acquisition is Energy Fuels' first in-situ leaching property; previously the company produced its uranium conventionally from high-grade breccia pipes in the Arizona Strip.

Argentina to Privatize Nuclear Plants

The government of Argentina recently announced its intent to sell its two operating nuclear reactors to private investors in order to raise cash to complete construction on the country's third reactor. Argentina's Economy Minister stated that the sale of the 600-MWe Embalse HWR and the 335-MWe Atucha 1 HWR is scheduled for completion by January 1, 1994. The two reactors achieved an average capacity factor exceeding 88 percent in 1991 and contributed more than 17 percent of the nation's electricity supply. The money raised will be used to complete Atucha 2, a 692-MWe HWR, that is approximately three-fourths complete. While the viability of the proposal has been questioned due to the risk and liability that must be assumed by the new owners, the step is part of the Ministry's drive to develop more fully a market-based economy.

◆ ◆ ◆

Japan's 43rd Reactor Achieves Criticality

On May 28, Kansai Electric Power Company's Ohi 4 reactor achieved criticality. Kansai EPC plans for the 1,121-MWe PWR to enter commercial operation in early 1993.

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TRANSPORTING URANIUM FUELS

The transport of nuclear materials is often overlooked when viewing the front-end of the nuclear fuel cycle. However, when book transfers are not practical, a well-managed transport program is a significant factor in customer satisfaction for nuclear fuel purchases. Some of the logistical considerations of transporting uranium concentrates and uranium hexafluoride include which type of cylinders to use for transport, modes of transport available, sampling, shipment scheduling, and coordination of transportation services. Further consideration must be given to the numerous domestic and foreign regulations, fees, and issues of insurance; however, the complexity of these latter issues prevents their complete analysis in this discussion.

TRANSPORT CONSIDERATIONS

The mode of transport can be aircraft, ship, railroad, truck, or a combination thereof. Generally, a combination of transport modes is needed for a single transport; utilization of combined transports is called intermodal transport. Much of the transport equipment is standardized for handling by more than one mode of transport without opening or reloading. Examples of the most common intermodal equipment are ocean shipping containers (**Figure 1**) and flat racks, that can be transported by steamship, railroad, or truck, and sometimes by aircraft.

Ocean shipping containers are basic 20- or 40-foot long corrugated steel boxes, 8.5 feet high and 8.0 feet wide, with double, full-width doors at one end, and a secondary wood floor. A flat rack is similar, but has two vertical end plates and no top, sides, or doors (**Figure 2**). Not all carriers handle all types of intermodal equipment, so it is necessary to verify compatibility of intermodal transport equipment with all the carriers involved.

Transport equipment, including intermodal, such as truck trailers, railroad cars, and shipping containers, may come in varying lengths, with each length and type having a unique weight limit to be considered in conjunction with inland transport regulations. Likewise, it is important to consider these differences, since each carrier may use only certain sizes of transport equipment. Significant time could be lost if a carrier does not have the equipment available to handle the size of the shipment, or if incompatible equipment requires unloading and reloading.

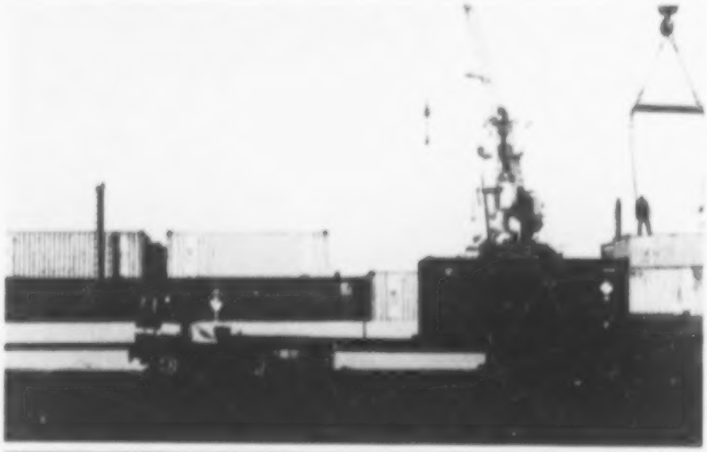

Figure 1 — Ocean Shipping Containers. A 20-foot container on a 40-foot container chassis awaits loading onto a cargo container ship.

Trucking, rail, and steamship companies can normally provide the container chassis to transport ocean shipping containers or flat racks on the highways. The chassis is basically a truck trailer frame and running gear on which the ocean shipping container or flat rack is placed. Any carrier who intends to pull the steamship line's equipment must complete an equipment interchange agreement with the steamship line, which allows the equipment to leave the port area and provides liability against damage. The cost in dollars and time to have the container chassis at the pickup location for loading, and to have it returned after unloading, determine which carrier's chassis should be used for delivery.

Another factor to be considered is the shipping facility's handling capacity. Each facility has a limit on the number of cylinders or transport equipment it can load or unload per day. Those limits and their effect upon the shipping schedule are an important element.

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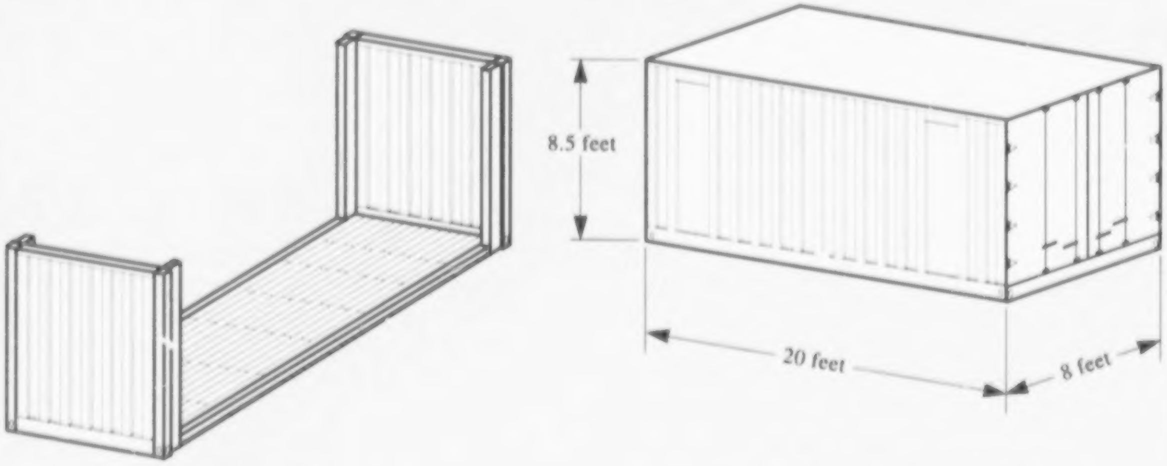

Flat Rack (20')

Ocean Shipping Container (20')

Figure 2 — Typical Flat Rack and Ocean Shipping Container. Both types of transport equipment come in lengths of 20 feet or 40 feet, although the 40-foot lengths are used less often in the transport of nuclear fuels.

Basic Documentation and Fees

- When booking a steamship line, the steamship line agent provides a **booking number**. This booking number is a contract to ship cargo on a particular ship, to and from specific ports, in a particular time frame. The booking number is usually a series of numbers and letters signifying the ship's name, the voyage number, the port of export, and date of export.
- A **bill of lading**, required by US federal law, is a contract between the carrier and the shipper (or its agent) to transport the defined cargo in accordance with all laws and requirements for the specified cargo, and in a reasonable period of time.
- The US Nuclear Regulatory Commission (NRC) and the US Department of Energy (DOE) use a document titled **Form 741** as the primary document for the accountability of nuclear materials. It is the responsibility of the shipping/receiving facilities to complete and distribute Form 741 in accordance with its instructions. To import or export nuclear equipment or materials may require an NRC **import/export license**, per *Title 10 CFR, Part 110*.
- The Department of Commerce, under the Bureau of Census, requires an exporting shipper to file a **shipper's export declaration**, which the Department uses for verification and statistical information gathering.
- For importing, the Bureau of Customs charges a **customs users fee** (except for re-imported US goods) and requires a **delivery verification certificate**, which contains entry information. Any goods passing through a US seaport must pay the **harbor maintenance fee**.
- The US Department of Transportation (DOT) has specific regulations regarding the **transport of hazardous materials**, including radioactive materials. These regulations include specific ways the materials must be referred to on all shipping documents and specific markings that must be displayed on the materials under transport, as well as displayed on the transport vehicles. Uranium hexafluoride (UF_6) qualifies as both a radioactive substance and corrosive substance under *Title 49 CFR, Part 173*, and must be labeled as such.

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SHIPPING URANIUM ORE CONCENTRATES

Concentrates are usually shipped from the mill to the converter, but sometimes are shipped to, or from, an intermediate storage facility. A mine sells uranium ore concentrates (simply called concentrates) to the customer by the pound of contained triuranium octoxide (U_3O_8) equivalent, with the cost of transportation to the converter commonly included as part of the concentrates' per-pound price.

Concentrates are packaged in 55-gallon drums, supplied by the uranium mill or the converter, that by federal regulation must not allow any leakage during transport. The shipping weight of a 55-gallon drum is approximately 50 pounds empty and 800 to 1,050 pounds when filled with concentrates. Uranium ore concentrates contain between 80 and 98 weight-percent (${}^{w}/_{o}$) U_3O_8 equivalent. Therefore, a drum of concentrates can contain from 600 to 980 pounds of U_3O_8 equivalent. Buyers and sellers typically use a value of 850 pounds contained U_3O_8 equivalent per drum as an average in quotations. However, as a shipper uses actual weight, money is saved when shipping concentrates closer to the 98 ${}^{w}/_{o}$ U_3O_8 than the 80 ${}^{w}/_{o}$ level, as less waste material is transported.

Sampling

When a uranium mill has completed the processing of a batch lot of uranium ore (a batch lot of ore usually contains between 35,000 and 50,000 pounds of U_3O_8, the quantity determined by contract), it takes representative samples from throughout the batch lot. The samples are combined into a master sample and then separated into samples of 150 grams U_3O_8 equivalent each, which are put into sample bottles (half-pint mason jars). The mill's portion of the master sample is analyzed by the mill laboratory prior to shipment, to test the level of impurities and to verify that the batch lot meets contractual chemical specifications.

Typically, one sample (the umpire sample) is held on reserve by the mill to be analyzed by an independent laboratory in the event of a dispute between the analytical results of the mill and those of the converter. The independent laboratory's results are usually binding on both parties for settlement. When shipping and receiving facilities have established routine practices and the quality of the product is known, samples are not sent in advance, but are held in reserve in case of a question or formal dispute.

The contract for delivery will contain the exact sample terms and conditions. The converter samples the concentrates when they are received and typically has 30 days to dispute the mill's test results. If material does not meet the contractual specifications, the owner of the material, or the supplier, usually is responsible for the converter's surcharges for reducing the impurities to acceptable levels.

Samples are normally sent by mail or by courier, since they contain internationally exempted limited quantities of radioactive material. Exempted limited quantities of radioactive material include those containing less than 15 grams of ^{235}U, and thus are exempted from having to meet the full licensing and regulations required of larger shipments. Each courier company has its own requirements for shipment, and some choose simply not to handle any radioactive materials, whether exempted or not. By US federal regulation, *non*-exempted quantities of radioactive materials cannot be shipped through the US Postal System or by passenger aircraft.

URANIUM HEXAFLUORIDE

Uranium hexafluoride (UF_6) is a compound formed of hexavalent uranium and fluorine, and has special properties that make it the standard form for shipping and processing uranium. One special property of UF_6 is that at 147°F and 22 psia it has a "triple-point", a rare quality that allows it to exist as a solid, liquid, and a gas, all at the same time. The fact that the requisite temperature and pressure are relatively low is useful for production, as it allows UF_6 to be used as a gas in processing, as a liquid for feeding into and withdrawing from storage, and as a solid while in storage or transit. UF_6 as a liquid, even though it is heavy, has a low viscosity that allows it to flow freely. This special property eases its loading into and out of pressure cylinders. Another special property of liquid UF_6 is that it does not react with oxygen, nitrogen, carbon dioxide, or dry air. However, liquid UF_6 is not stable at normal atmospheric pressure, and does react rapidly with water vapor, as does the exposed surface of solid UF_6, releasing corrosive hydrogen fluoride. Therefore, UF_6 is always handled in leak-tight containers and processing equipment to avoid reaction with the moisture in normal atmosphere.

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Uranium constitutes approximately 67.6 percent of the weight of UF$_6$. The natural enrichment of the uranium contained in UF$_6$ is 0.711 w/o uranium-235 (^{235}U, the fissile isotope of the element uranium). References to "UF$_6$" usually infer UF$_6$ at natural enrichment levels. *Enriched* uranium hexafluoride is more commonly referred to as enriched uranium product (EUP). For transport definitions, EUP is UF$_6$ that contains more than, or equal to, 1.0 w/o ^{235}U.

A conversion facility receives concentrates, and then returns UF$_6$ at natural enrichment levels. The ^{235}U content in UF$_6$ is increased to the desired level at an enriching facility. The majority of the world's commercial nuclear reactors are the light-water type, and thus require the level of ^{235}U in UF$_6$ to be increased to between 2.5 w/o and 4.5 w/o, depending on the particular design and operation of the reactor. This EUP is then processed at a fabrication facility into UO$_2$ pellets that are loaded into fabricated fuel rods to be used in a nuclear reactor. Transportation is required after each phase of the front-end cycle and is usually subcontracted to a specialty transportation carrier. Shipping of the fabricated fuel rods is handled by the fabricator, however as the design and dimensions of the fuel rods for US reactors are generally unique to each reactor and therefore require specialized handling and shipping containers.

Shipping Natural UF$_6$

UF$_6$ is packaged at the converter's facility into cylinders that US federal regulations require to be designed and built to American National Standards Institute (ANSI) design N14.1 standards. The International Atomic Energy Agency (IAEA) has standards for UF$_6$ cylinders too, which supercede any domestic standards. The IAEA is working with a number of countries to develop new standards to be used internationally by 1993.

Steel UF$_6$ cylinders with valves have been made in two common sizes (outside of the former Comecon-member countries): the 10-ton (Model 48X) and the 14-ton (Model 48Y) (**Figure 3**). Uranium hexafluoride, both natural and enriched, corrodes the mild steel used in these cylinders. However, UF$_6$ corrosion forms a film which significantly reduces further corrosion, making the use of more expensive metals unnecessary.

The majority of US conversion facilities use the 48Y cylinder for shipping because it holds 25 percent more material per cylinder than the 48X model; therefore, more UF$_6$ can be filled/emptied with less cylinder handling. Also, 48X cylinders are not acceptable to the IAEA for international shipment; they are used occasionally for domestic shipments, but now are used primarily for additional storage.

Uranium hexafluoride normally enters a cylinder as a liquid, but contracts when it changes to its solid form after filling. Since it has one of nature's largest expansion factors, gaining nearly a third in volume when changed back from a solid to a liquid, the legal limit for filling a UF$_6$ container is 61 percent of capacity. Because of the UF$_6$ expansion factor, it is very important that cylinders not be overfilled. If care is not taken to observe caution in filling, which is done under pressure, the expansion of the UF$_6$ when returned to its liquid state could rupture the cylinder.

For shipping, consideration must be given to the quantity of UF$_6$ and its destination, to determine how many cylinders are required, and the mode(s) of transport. The time required for filling the cylinders and making preparations for shipment, is also a consideration, since the time necessary for filling and preparation varies with each contract and conversion facility. Further, a shipment of UF$_6$ may require four shipments—empty UF$_6$ cylinders shipped to the loading facility, full cylinders shipped to the enrichment facility, emptied cylinders possibly shipped to a cleaning facility, and the cleaned/empty cylinders shipped to a designated return location.

Sampling

European and North American converters take samples of the UF$_6$ in each cylinder at the time the material is withdrawn from the conversion line and loaded into the cylinder. A 2S-type sample cylinder is usually used for these in-house samples (**Figure 4**).

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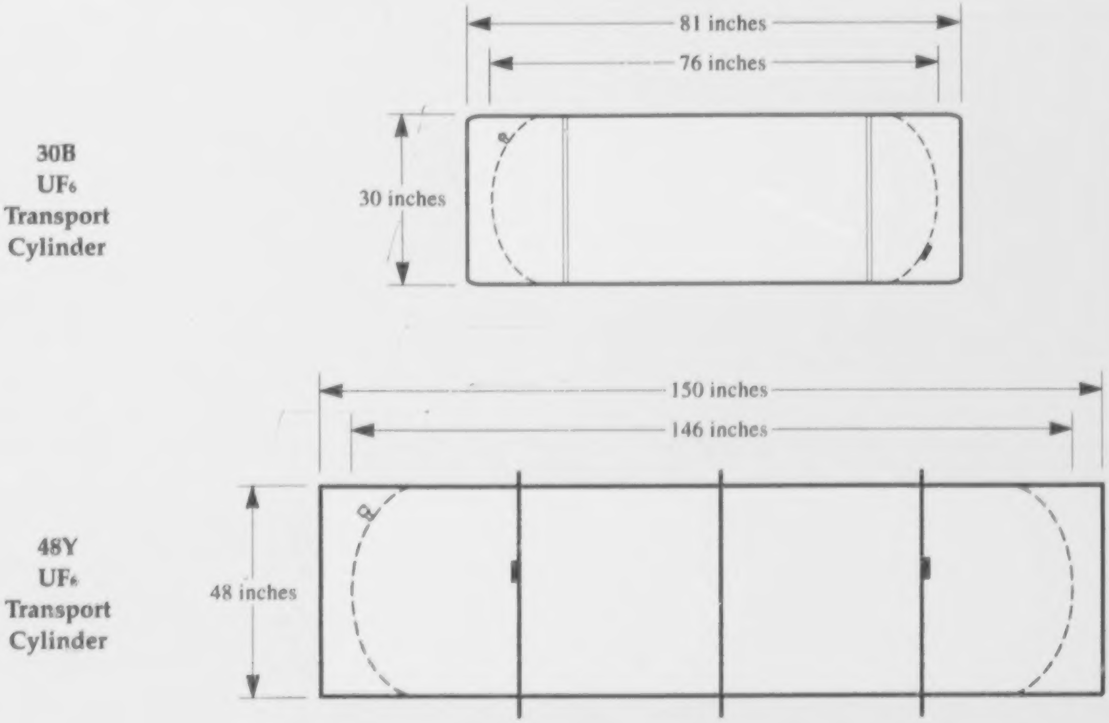
Figure 3
30B AND 48Y TRANSPORT CYLINDERS


81 inches
76 inches
30B
UF6
Transport
Cylinder
30 inches
150 inches
146 inches
48Y
UF6
Transport
Cylinder
48 inches

UF$_6$ CYLINDER DATA			
	(unit)	**30B**	**48Y**
Nominal Diameter	inch	30	48
Nominal Length	inch	81	150
Basic Material (spec. ASTM A-516)		Steel	Steel
Empty Weight	pound	1,400	5,200
Max. UF$_6$ Weight	pound	5,020	27,560
Max. Gross Weight	pound	6,420	32,760
Max. Volume	cubic feet	26	142.7
Service Pressure Limit	psig	200	200
Isotopic Content Limit (with moderation control)	w/o ^{235}U	5.0	4.5

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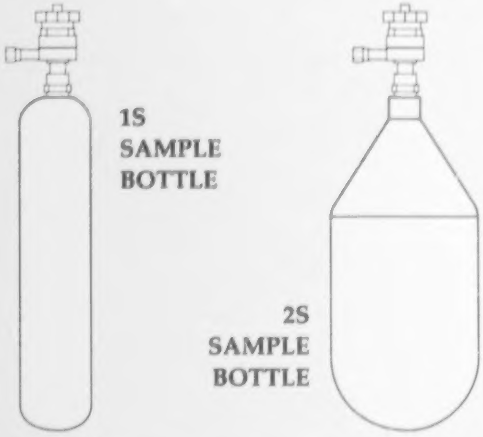
Figure 4
1S AND 2S SAMPLE BOTTLES



SAMPLE BOTTLE DATA

	(unit)	1S	2S
Nominal Diameter	inch	1.5	3.5
Nominal Length	inch	11.0	11.5
Basic Material	—	nickel	nickel
Empty Weight	pound	1.75	4.2
Max. UF_6 Weight	pound	1.00	4.9
Max. Gross Weight	pound	2.75	9.1
Max. Volume	cm^3	150	736
Service Pressure Limit	psig	200	200

Samples are not generally sent to the enrichment facilities in advance. However, shipments of UF_6 sent to Russia for enrichment must have the 2S sample cylinder attached to the skirt of the 48Y cylinder from which the sample was taken. The sample must have a tamper-indicating seal, and be enclosed in a box bolted with two bolts onto the 48Y cylinder, in the eight o'clock position. The sample box itself also must be sealed with a tamper-indicating seal.

The conversion facility keeps samples of the UF_6 to check its quality prior to shipping and, as in the case of concentrates, as umpire samples in case of a dispute. The receiving enrichment facility also may take samples from the cylinders and test the samples prior to feeding the UF_6 into its enrichment processing lines. Which party bears the cost of restoring non-specification material to contract specifications is a matter for contract negotiations.

Commercially Enriched UF_6

EUP is packaged at the enrichment facilities into a steel cylinder, which is then placed in a protective shipping package (PSP), also called an overpack (**Figure 5**). The EUP cylinders used are usually Model 30B, which replaced the Model 30A previously used. The two cylinder types are visually distinguishable, as the 30B has convex ends (Figure 3), while the 30A has concave ends. The 30A was designed to contain the EUP during normal transport conditions, while the 30B is designed to survive accident conditions—the reason for its frequent use today. Because the 30A cylinder was not designed to survive accident conditions, it is no longer approved by the IAEA for international shipments and will not be accepted at DOE facilities after December 31, 1992.

The PSP is used to physically separate the cylinders to avoid any possibility of a critical chain reaction. The PSP also protects the cylinder and its valve from injury in transportation accident, which may or may not involve fire. A PSP consists of a cylindrical double shell with top and bottom halves. The 6.5-inch thick shells are composed of stainless steel inner and outer liners, with the space between them filled with a fire resistant insulation, such as phenolic foam. Each shell half has an internal framework of rolled angle sections, and the bottom half of the shell has a cradle, formed from angle iron, welded to it. The cradle has four feet with holes, allowing the PSP to be bolted to the floor of the trailer, ocean shipping container, flat rack, railroad car, or aircraft cargo floor (**Figure 6**). Except for aircraft, this custom bolting is one of the main reasons transportation equipment has a secondary floor of wood, as it makes attachment easy. Both halves of the PSP have four shock-absorbing pads, and twenty vents designed to allow gases to escape in the event of fire. The vents normally are sealed from moisture by plastic caps. The top and bottom halves of the overpack are sealed by a rubber gasket, and joined with fourteen bolts and nuts.

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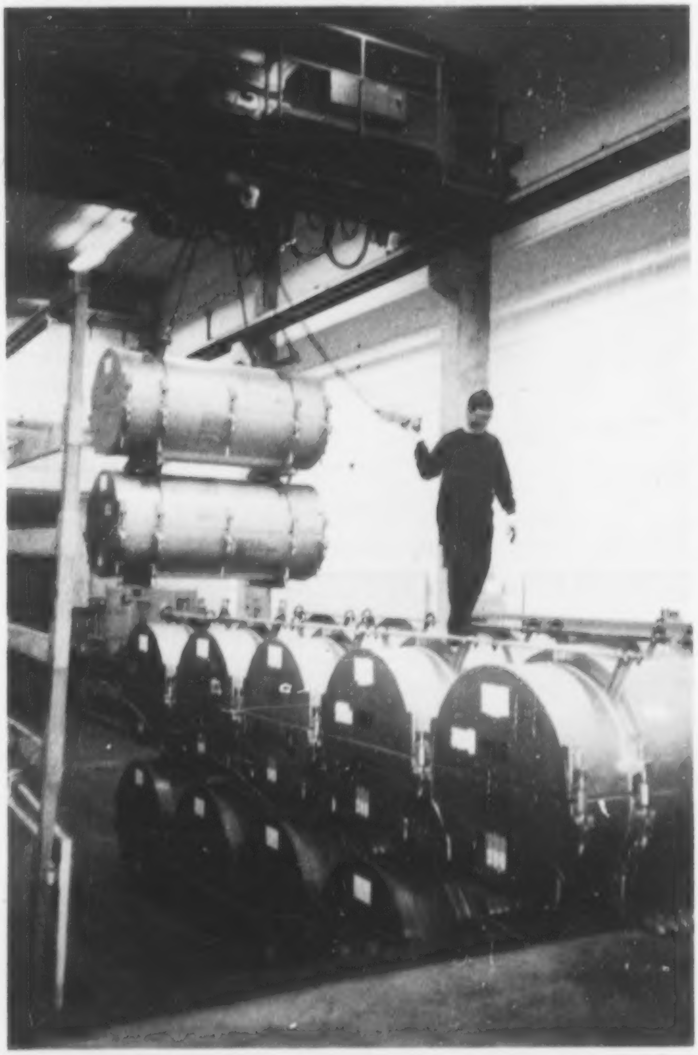

Figure 5 — 30B Cylinders in PSPs. Two 30B cylinders in their protective shipping packages are moved into position in a freight staging area.

Empty cylinders usually need to be at the enrichment facility two to three months in advance of the contractual delivery date to allow the facility time to examine the cylinders and complete any maintenance required before filling them. The PSPs must be at the enrichment facility a week in advance, but normally are delivered earlier to assure time for examination and approval. Conditions that normally require further inspection or removal from service are: excessive warping, distortion, or other damage to the liner or shell that prevents a tight closure of the package; excessive clearances for the inner container from the liner; fastener damage or loss; reduction in thermal insulation thickness in any area; and any other damage or condition that would bring into question the integrity of the PSP as a fire- and shock-resistant housing.

Another important consideration in scheduling shipments of EUP is that its transport may actually entail up to six separate shipments: the shipment of the cylinders and the PSPs to the enrichment facility (possibly from different locations), the shipment of the EUP from the enricher to the fabricator, the return shipment of the PSPs, and the return shipment of the empty cylinders, which may also require an interim shipment to another facility for cleaning.

For shipping, EUP is typically measured in kilograms, and one cylinder can transport approximately 1,500 kilograms of EUP, enriched to less than 5.0 $^{w}/_{o}$ ^{235}U. Ready for shipping with its overpack, the 30B has a gross weight of 8,200 pounds. The size and weight of the cylinders with PSPs are both important for calculating ocean and European railroad rates, since these rates are based on the greater of size or weight.

With an effective US domestic highway weight limit of about 38,000 pounds of cargo, five or six partially filled cylinders with their PSPs are all that can be transported on a 40- or 45-foot truck trailer. Yet, on a 20-foot trailer, four full cylinders with PSPs will fit. Easily recognized is the fact that the 40- or 45-foot truck trailers are not able to use their space as efficiently as the 20-foot trailers. Adding to the difficulty in selecting the appropriate transport equipment length is that steamship lines charge a flat rate which is more cost efficient for shipping 40-foot equipment than 20-foot equipment.

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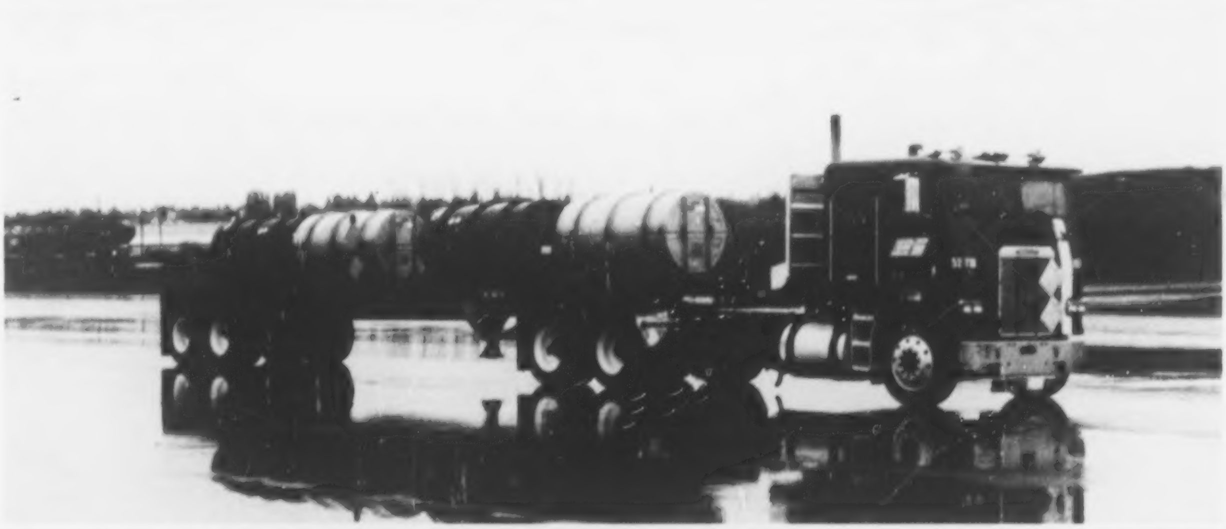

Figure 6 — 30B Cylinders in PSPs bolted on a flatbed truck trailer.

Sampling

Samples of EUP are taken by the enrichment facility under observation by a witnessing agent of the customer. The enrichment facility draws an umpire sample, an in-house sample, a sample for the fabricator's laboratory, and a sample for the witnessing agent. The facility then sends a sample to a laboratory designated by the fuel fabricator for analysis prior to shipment. Samples are generally secured in 1S bottles (Figure 4), except for the laboratory sample which is normally placed in a P10 tube. Such samples may exceed the maximum allowed 15 grams of ^{235}U for exemption, and therefore require the same licensing and documentation as the main shipment.

CONCLUSION

Certainly there are many more details, and situation-specific issues, but even this basic overview of the physical aspects of transporting uranium fuels illustrates the large number of intertwined considerations of costs, time, location, equipment, and documentation. With prices falling in the uranium industry, the margin of profitability on uranium sales is low, making transportation cost an especially significant issue. ●

Jeffrey D. Price
Alan L. Wolcott

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NUCLEAR FUEL REPROCESSING

The reprocessing of irradiated nuclear fuel is one of two alternatives currently employed to manage spent fuel discharged from commercial nuclear reactors, the other method being interim storage of spent fuel followed by permanent disposal. In the early years of commercial nuclear power, evaluations indicated reprocessing was an economical fuel management method. Consequently, most countries with nuclear generating capacity chose to pursue some level of reprocessing.

From a technical viewpoint, reprocessing followed by recycling is feasible and more efficient in resource utilization than storage and permanent disposal of spent fuel. This efficiency, plus reprocessing capability from plants built for military purposes, caused France and the United Kingdom (UK) to select the reprocessing option early in their nuclear history. Many other countries have chosen to store spent fuel on a long-term basis until reprocessing facilities are constructed, and have contracted with France or the UK for reprocessing services.

In spite of these commitments, only thirty percent of the over 120 thousand metric tons of commercial spent fuel discharged since 1963 has been reprocessed. The remainder has been stored pending reprocessing or the development of permanent disposal facilities. Of the countries pursuing reprocessing, only the UK, France, and the former Soviet Union have developed significant commercial reprocessing capacity. India and Japan have installed reprocessing plants of relatively small capacity, and the CIS (which contains the facilities of the former Soviet Union) and Japan are currently building large additions to their facilities.

The USA, Canada, Sweden, and several other countries have elected not to use reprocessing. Nations such as Spain, South Korea, Mexico, and others have postponed their decision on permanent disposal and have selected long-term, interim storage of spent fuel as their current method of ending the nuclear fuel cycle. It is important to note that closed fuel cycles (reprocessing followed by recycling), as well as open fuel cycles (storage followed by permanent disposal) require facilities for permanent disposal of high-level wastes (**Figure 1**). However, to date, there are no licensed, permanent disposal facilities for spent fuel or high-level waste anywhere in the world. Temporary, long-term storage of spent fuel and high-level wastes will continue until the interim storage facilities are filled to capacity or until permanent disposal facilities are constructed and licensed.

Since most of the spent fuel that has been reprocessed is stored as uranium (U) and plutonium (Pu), two of the most important issues currently affecting the reprocessing cycle are the development of facilities to fabricate fuel from the recovered plutonium and uranium, and the licensing of power plants to use these fabricated fuels. Fabrication capability for mixed oxide (MOX) fuel has been successfully developed and installed, principally in Germany, but the world capacity for fabricating MOX fuel is much too small relative to the existing amounts of recovered plutonium and uranium. In addition, while the use of MOX fuel in light water reactors has been well developed and tested, few reactors worldwide are licensed or inclined to use MOX fuel, principally because it is not economical compared to inexpensive fresh uranium. Fast breeder reactor (FBR) technology that uses plutonium also has been slow in developing, and currently only a few FBRs exist. Nevertheless, the tremendous financial investments already made in reprocessing capability likely will deter rapid departure from the use of reprocessing.

Other issues affecting the use of reprocessing include: accountability (from both a criticality and a safeguards viewpoint); proliferation-resistant processes; transport and storage of large amounts of plutonium; environmental protection from highly toxic plutonium; and the ultimate fate of the liquid, gaseous, and solid high-level wastes that result from reprocessing activities.

THE PROCESS

Spent fuel has been reprocessed since the early 1950s, and although the technique is simple in concept, it is complex in practice. It is similar to other industrial processes that extract valuable material from wastes, but has the added complexities of radioactivity, criticality, and toxicity.

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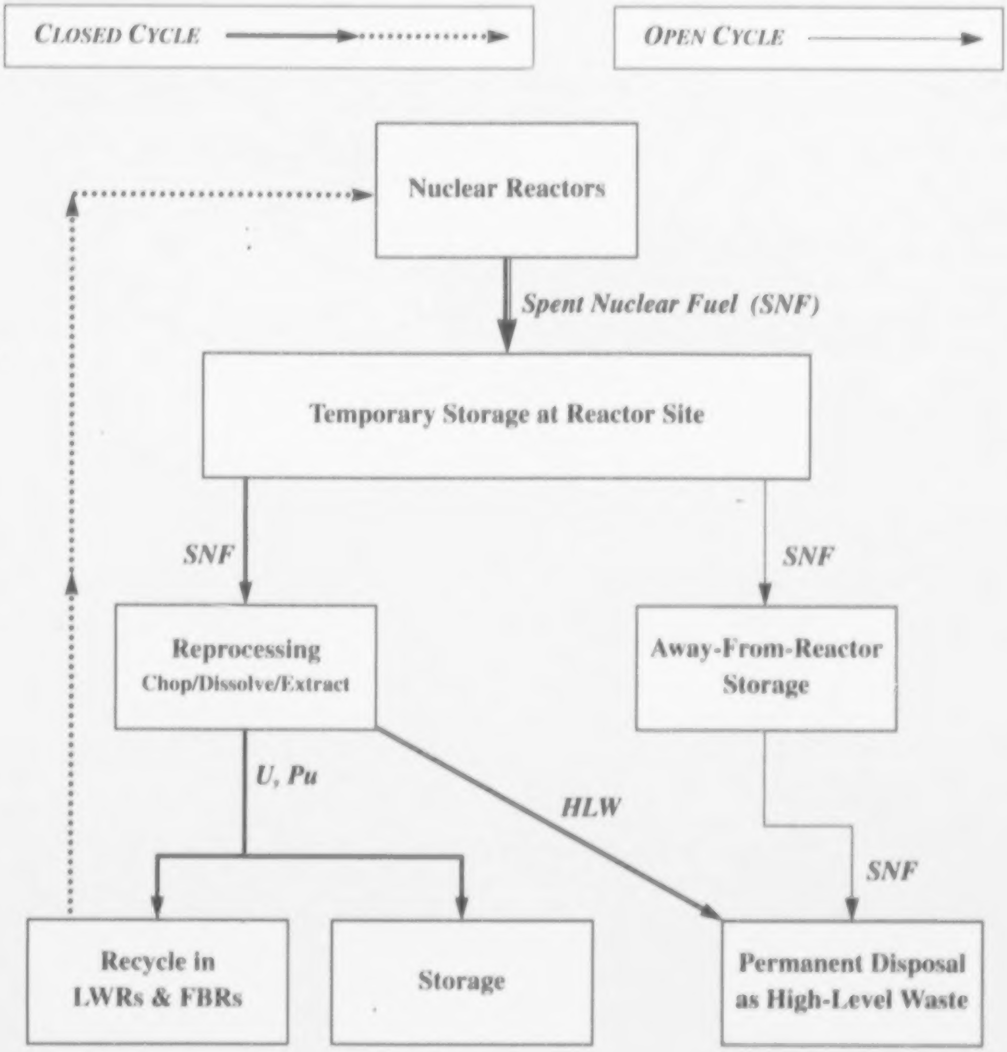
Figure 1
SPENT FUEL MANAGEMENT OPTIONS


CLOSED CYCLE
OPEN CYCLE
Nuclear Reactors
Spent Nuclear Fuel (SNF)
Temporary Storage at Reactor Site
SNF
SNF
Reprocessing
Chop/Dissolve/Extract
Away-From-Reactor Storage
U, Pu
HLW
SNF
Recycle in LWRs & FBRs
Storage
Permanent Disposal as High-Level Waste

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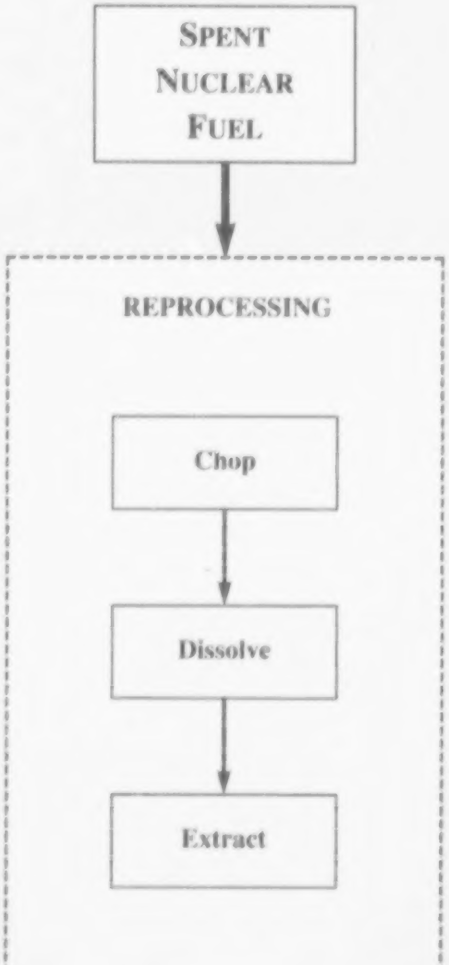
Basically, the process can be described by the chop-dissolve-extract phases. The spent fuel is disassembled and mechanically chopped into small pieces, dissolved in hot nitric acid, and then subjected to chemical extraction of uranium, plutonium, and wastes (**Figure 2**).

The activities performed in the reprocessing of oxide fuel from thermal, light water reactors are essentially the same in all facilities worldwide. Spent fuel assemblies arrive at the reprocessing facility by truck or rail, in shielded, cooled containers, which are then vented and purged. The fuel assemblies are removed from the containers under water and stored until they are ready for processing. The assemblies are checked for fissile content, burn-up, and cooling time and then transported to the shearing station. At this station, the fuel assemblies lie horizontally under hydraulically drawn cutting blades that shear the fuel and cladding into small pieces. The pieces fall into a basket submerged in a dissolver of hot nitric acid. Shearing and dissolving occupy about two eight-hour shifts at the THORP facility in the UK, which has a dissolver capacity of 1.7 tonnes of sheared fuel.

During dissolution, some volatile products are discharged as gases, some are precipitated as solids and cast in cement for disposal, and others are discharged in aqueous streams. The residual cladding is encapsulated in cement for disposal. The dissolver liquor is centrifuged to remove fission-product solids and bits of cladding that are also encapsulated for disposal. The clear dissolver liquor is then conditioned in preparation for the extraction of the plutonium and uranium, and stored until ready for the extraction by chemical separation.

The plutonium and uranium extraction processes used throughout the world are variations of the PUREX (Pu-U-Recovery-Extraction) process. One typical variation employs uranous nitrate/hydrazine and nitrogen oxides as the plutonium reducing and oxidizing agents. Hydroxylamine also is used as a reducing agent at selected stages. Separation of plutonium and uranium occurs in pulsed columns, and the resulting plutonium solution is precipitated by an oxalate process. The precipitate, plutonium oxide, is then stored. The uranium solution resulting from the separation, uranyl nitrate, is converted to uranium trioxide in fluidized beds, using the thermal denitration process. The trioxide powder is then placed in drums for storage.

Figure 2
REPROCESSING FLOW CHART



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Offgases and liquid radioactive wastes are treated as follows. Gases from denitration are cooled and condensed, and the liquors routed to evaporators for treatment and acid recovery. Oxides of nitrogen are converted and the inert materials discharged. High- and medium-level wastes are sent to evaporators for concentration, solidification, vitrification, and disposal; low-level wastes are selectively discharged or prepared for disposal, thus completing the reprocessing portion of the cycle.

PROLIFERATION AND SAFEGUARDS

One of the major issues regarding reprocessing, and an often-named drawback, is proliferation. This concern was a primary factor in the decision of several countries, including the USA, not to reprocess. Throughout the world, governments, companies, and individuals have expressed concern that the element separation that occurs during the reprocessing cycle isolates material, in particular, plutonium, that could be diverted by a country or terrorist group to make a nuclear weapon. While the likelihood of this occurring is very low and the development of a weapon from such material would be extremely difficult, it is technically feasible, and this has led several countries to decide against a closed fuel cycle for their commercial nuclear power program.

In 1977, US President Carter initiated two studies, one domestic and one international, to examine non-proliferation issues. Both the US-based Nonproliferation Alternative Systems Assessment Program (NASAP) and the International Nuclear Fuel Cycle Evaluation (INFCE) studies reached some similar conclusions. The three-year studies found that while no nuclear fuel cycle was 100-percent "proliferation proof", the diversion and misuse of material from civilian nuclear facilities was unlikely and was not an easy or efficient means for a group to develop a weapon. The reports also found that while reprocessing and recycling could save uranium and were economically feasible, existing political and regulatory barriers counteracted any economic benefit. NASAP favored an open fuel cycle as more proliferation-proof, since it makes it more difficult to isolate the material necessary for weapons; INCFE stated there was little safety difference in the two cycles. However, both studies strongly agreed that stringent safeguards were the best means of assuring non-proliferation.

Since the time of these studies, the economic benefits of reprocessing have decreased with the falling price of natural uranium, and weapons proliferation issues, after being a lesser concern in the 1980s, have re-emerged as an important global issue. The primary means of proliferation detection is accomplished by the Department of Safeguards of the International Atomic Energy Agency (IAEA). The IAEA accounts for uranium and plutonium throughout the world, using safeguards guidelines from the 1968 Treaty on the Non-Proliferation of Nuclear Weapons (NPT) and from individual safeguards agreements with each country. The IAEA has done an outstanding job tracking material, but the effects of zero real growth in IAEA funding since 1983 were illustrated by the weapon-development discoveries made in Iraq following the war in the Persian Gulf. As a result, there are now frequent calls to enhance IAEA's safeguards enforcement abilities, and decisions as to which fuel cycle to adopt are being closely examined. Nevertheless, the safeguards system now in place does an excellent job of accounting for radioactive materials, and the decision whether or not to pursue the reprocessing and recycling option is primarily an economic choice.

REPROCESSING IN SELECTED COUNTRIES

France

France is a world leader in research and development for reprocessing. The country is committed to a closed nuclear fuel cycle and currently has a total reprocessing capacity of over 1,500 metric tonnes heavy metal (MTHM) per year at three plants and is expanding capacity (**Table 1**). The first plant, designated UP1 (Usine de Plutonium-1), was commissioned in 1958 and is located at Marcoule in southern France. The UP2 and UP3 plants are located at La Hague in northwestern France and were commissioned in 1966 and 1992, respectively.

The UP1 facility initially was committed to defense work only, but now also handles civilian reprocessing of metallic fuels from gas-cooled (GCR) and fast breeder reactors. It has a capacity exceeding 600 MTHM per year. Experience gained at UP1 was used in the design of UP2,

Table 1
COMMERCIAL REPROCESSING CAPACITIES BY COUNTRY
(Metric Tons Heavy Metal Per Year)

Country	Current	Planned Additions	Total
France	1,500	700	2,200
United Kingdom	1,500	1,200[1]	2,700
Commonwealth of Independent States	400+	1,500	1,900+
Japan	210	800	1,010
Germany	Shutdown	0	0
TOTAL	3,610+	4,200	7,810+

[1] THORP facility is operating, and will complete its two-year commissioning process later this year.

which handles only metallic fuels from GCRs. Reprocessing capabilities for LWR fuel were added to UP2 in 1973 and for FBR fuel in 1979. UP2 currently has a capacity of 400 MTHM per year and is in the process of being upgraded to 800 MTHM per year to handle domestic oxide fuel only. This expansion is scheduled for completion in 1993. For reference purposes, the pre-expansion plant has been designated UP2-400, and the new, post-expansion plant, UP2-800.

UP3 became fully operational in late 1990 and was commissioned on April 14, 1992. It contains state-of-the-art processes that reduce worker radiation exposure and lower the volume of waste. Six countries—Japan, Germany, Sweden[1], Switzerland, Belgium, and The Netherlands—provided US$5 billion in financing to build UP3, which will reprocess foreign fuels exclusively. Cogema, the French company responsible for all reprocessing activities in France, has take-or-pay, cost-plus-fee contracts with these countries. The initial capacity of UP3 is 500 MTHM per year, and is expected to be increased to 800 MTHM per year during the next two years. To facilitate fabrication of mixed-oxide fuel, improvements planned for UP3 include a unit to remove americium from plutonium. Long-term research and development on neptunium removal underway in the Atalante program at the Marcoule research center was postponed for a year to reduce costs and allow rethinking of research on reprocessing.

A technological risk report released in early 1991 called for reconsideration of France's entire nuclear fuel cycle. The report recommended that a plan for the final disposal of nuclear wastes, currently stalled in France, become the focus of attention. The report also questioned the continuation of reprocessing because there is currently little use for recycled fuel: there is insufficient MOX fabrication capacity, the MOX program for reactors has not progressed as planned, and fast breeder reactors have made even less progress. Furthermore, there are no existing programs expected to be able to consume the plutonium or the reprocessed uranium made available by reprocessing. In addition, France has contracts for reprocessing foreign spent fuel, and there is the possibility the countries with which it has contracted will refuse to take the reprocessing wastes, leaving France with additional disposal problems. The report recommended direct disposal of spent fuel without reprocessing as a better spent fuel management method, since there would be no reprocessing wastes and no plutonium or reprocessed uranium produced. Nevertheless, Electricité de France, the French national utility, stated in February 1992 that its spent fuel reprocessing policy was unchanged, and that thermal recycling of plutonium was still attractive, but must be matched with the capacity of the reprocessing facilities.

France has made a long-term commitment to reprocessing domestic and foreign fuel, and has invested large sums of money in reprocessing and recycling technology. Several countries totally depend upon France to do their reprocessing. For these reasons, French reprocessing policies are not likely to change soon, even though many factors are leading the country to re-examine its spent fuel management options.

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[1] Sweden initially had contracts to reprocess at the UP3 facility and provided some funding for its development, but has since changed its decision, and is not reprocessing its spent fuel. The country's contracts have been assigned to customers from Japan, Germany, and Switzerland.

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United Kingdom

The UK is committed to the reprocessing cycle and has reprocessed more spent fuel than any other country, producing more than 30 thousand metric tons in the last 30 years. The country currently operates more than 1,500 MTHM per year of reprocessing capacity at two primary plants. The British Nuclear Fuels plc (BNFL) Magnox reprocessing plant at Sellafield was started in 1952, and expanded in 1964 to a capacity of 1,500 MTHM per year. The plant reprocesses only metallic uranium from Magnox reactors, all of which are fueled by natural uranium. The Thermal Oxide Reprocessing Plant (THORP), also located at Sellafield, was built to reprocess enriched uranium fuel from light water reactors (LWR) and advanced gas-cooled reactors (AGR), and is currently going through a two-year commissioning (**Figure 3**). Its first-decade baseload capacity is 7,000 MTHM, with a target annual capacity of 1,200 MTHM per year. THORP reprocessing has been contracted for by utilities in the UK and in seven other countries: Japan, Germany, Switzerland, Spain, Sweden[1], Italy, and The Netherlands. Early contracts were the take-or-pay, cost-plus-fee type; more recent contracts use fixed-price terms. The UK also operates a small MOX fuel reprocessing plant at Dounreay with a capacity of 8 MTHM per year.

The UK has recycled considerable quantities of reprocessed material through the Magnox and AGR plants. For instance, approximately 75 percent of the initial cores for the AGR reactors was reprocessed material. Further recycling will be based mainly on fuel-cycle economics. Nuclear Electric recently completed a US$23 billion contract with BNFL involving reprocessing, fabrication, and decommissioning. Not all of the future discharges of spent fuel from Nuclear Electric's AGRs are covered by the contract, leaving the opportunity for a future decision by Nuclear Electric regarding long-term storage versus reprocessing. Scottish Nuclear Ltd. (SNL) also concluded long-term arrangements with BNFL, under which SNL committed to the reprocessing of an additional 330 tons of spent fuel, beyond the 618 tons already committed. In addition, the company announced that it had selected long-term dry storage for the rest of its AGR spent fuel. Thus, in spite of BNFL's heavy investment in reprocessing and commitments to other countries, UK utilities have demonstrated a desire to maintain their options and to lessen their commitment to reprocessing.

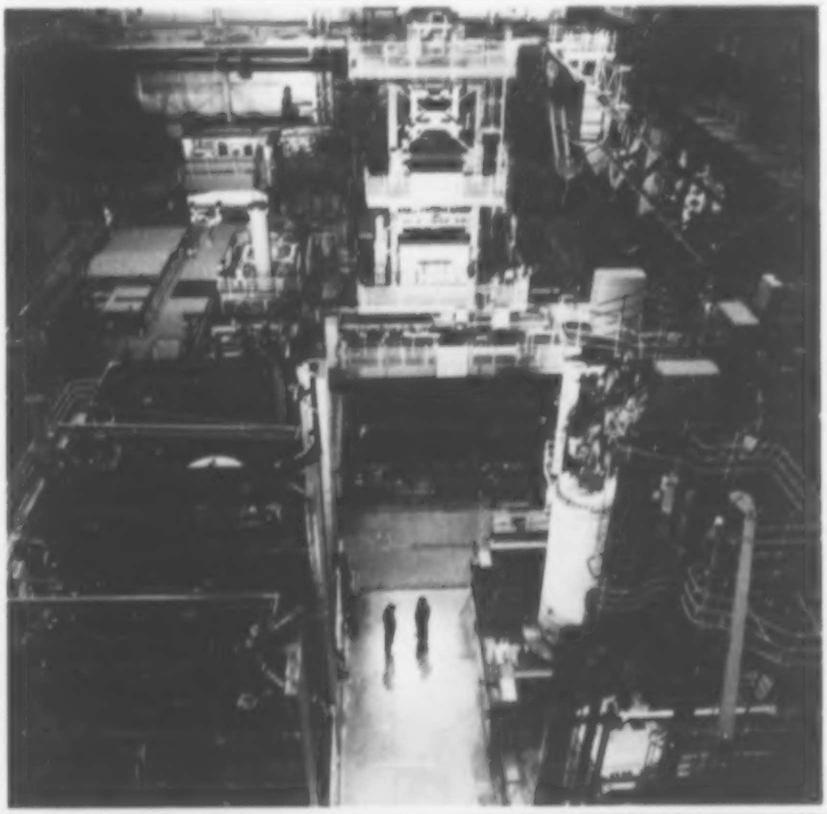

Figure 3 — THORP Facility. Receiving and storage area at BNFL's thermal oxide reprocessing plant. (*Photo courtesy of BNFL*)

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Commonwealth of Independent States

The Commonwealth of Independent States (CIS) is committed to the reprocessing cycle and operates reprocessing plants at two known sites in Russia. The Chelyabinsk-40 reprocessing plant is near Kyshtym on the eastern side of the Ural Mountains. The plant began operation in 1949 reprocessing military reactor fuel, and was modified in 1978 to handle naval reactor fuel. Today it has a capacity of 400 MTHM per year and reprocesses spent fuel from VVER-440 reactors in the CIS and central European countries, although no fuel has been accepted from these countries since 1990. The Tomsk reprocessing plant, near the city of the same name in Siberia, has operated since the mid-1950s at an undisclosed capacity. In 1978, it began reprocessing military production reactor fuel. Russia announced recently that it plans to restart construction on a third reprocessing plant at Krasnoyarsk with a 1,500 MTHM-per-year capacity.

The process used at Chelyabinsk is basically the same as that used by Western reprocessors, except that after three years of cooling, the hexagonal VVER-440 fuel is disassembled using an arc saw to remove the ends. The rods are then flattened to crack the pellets and fragmented by blades to separate the cladding and the oxide material, all of which is then dissolved in hot nitric acid. The PUREX process is used for separating plutonium and uranium, followed by purification using solvent extraction.

Scientists in the CIS have identified the recycling of uranium and plutonium as an urgent nuclear fuel cycle problem. As a result, they have fabricated and tested MOX fuels in fast breeder reactors. However, recognizing the delay in introducing FBRs in the CIS, they have turned to recycling uranium and plutonium in thermal reactors.

Reprocessing spent fuel has been carefully studied in the CIS, as has storage and disposal. Reprocessing has the drawback of creating hard-to-handle liquid and gaseous states of uranium, plutonium, and fission products, in contrast to the easier to handle, mostly solid materials dealt with in spent fuel storage and disposal. Nevertheless, reprocessing continues to be the fuel cycle policy of choice in the CIS, a decision probably carried by the inertia of earlier decisions to use reprocessing for military purposes.

Japan

Japan currently operates a 210 MTHM-per-year reprocessing plant at Tokaimura, and is constructing a larger, 800 MTHM-per-year plant at Rokkashomura on the northern end of the main island of Honshu. In the meantime, Japan has sent most of its spent nuclear fuel to BNFL in the UK and COGEMA in France for reprocessing. The first shipments of separated uranium, plutonium, and wastes from the reprocessing are to be returned to Japan beginning this year, as specified by the contracts with BNFL and Cogema.

Japan's commitment to reprocessing is coupled with the philosophy that recovered uranium and plutonium should be used domestically as an energy resource. Recycling would provide efficient use of uranium and less dependence on foreign uranium sources. In addition, reprocessing is preferred in Japan as a proper management method for disposal of wastes from spent fuel.

The construction of the reprocessing plant at Tokaimura began in 1971 by the Power Reactor and Nuclear Fuel Development Corporation (PNC). The design was carried out by the French company Societé Generale pour les Techniques Nouvelles (SGN), testing began in 1974, and the plant was commissioned in 1981. It has been operating near its design capacity since 1983.

The company in charge of construction of the new reprocessing facility at Rokkashomura is Japan Nuclear Fuel Services Co., Ltd. (JNFS). Although preliminary civil engineering began in 1988, the beginning of construction of the plant has suffered several delays and is now scheduled for December 1992. The plant, which has an estimated cost of US$6.2 billion, will utilize technology from France, the UK, and Germany. By the time the new plant begins operation in 1999, the planned nuclear generating capacity of Japan will have exceeded the expected reprocessing capacity of the Rokkashomura plant, so extensive facilities for spent fuel storage also are planned. Even so, Japan may have to continue sending spent fuel to France and the UK for reprocessing. The possible reduction or withdrawal of Japan from European reprocessing early in the next century is of great concern to maintaining the viability of European reprocessing facilities.

In regard to recycling, Japan has announced its plan for the use of plutonium. The country's intent is to recycle plutonium as MOX fuel for LWRs and advanced thermal

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reactors (ATR), and to pursue actively the development of fast breeder reactors for utilization of plutonium, while following a strict non-proliferation policy. Japan already has built two experimental FBRs, Joyo and Monju, and has two ATRs, one at Fugen and the other at Ohma. In addition, the European Fast Reactor R&D Steering Committee, a French, British, and German partnership that has been successful in coordinating FBR R&D under severe national budgeting pressure, recently signed a memo of agreement with four Japanese companies for cooperation and coordination of fast breeder activities.

That Japan is starting construction of a large reprocessing plant at the same time that France and the UK are rethinking their commitments to reprocessing is ironic, as is Japan's announced schedule for massive use of plutonium shortly after the European Fast Reactor project was delayed three years for technical and political reasons. Clearly, the potential for a limitless, recyclable fuel offered by the use of FBRs and the resulting national independence of fuel supply, are the forces driving Japan into large investments in reprocessing and recycling.

Germany

Until 1991, Germany had been committed by law to reprocessing as long as it was technically and economically feasible. In early 1991, the law was revised to make spent fuel storage and direct disposal legally equal to reprocessing, thereby allowing utilities to select either option. German utilities also are legally responsible for their spent fuel and wastes. However, because Germany's facilities and plans for reprocessing have been shut down, primarily for political reasons, many of the utilities have contracted with COGEMA and BNFL for reprocessing services. Plans for a 350 MTHM-per-year, national, commercial reprocessing plant at Wackersdorf in Bavaria were cancelled in 1989. The cancellation of Wackersdorf led to the 1990 closure of the WAK pilot reprocessing facility (Wiederaufarbeitensanlage Karlsruhe Betriebsgesellschaft mbH), a 35 MTHM-per-year facility operating since 1971. In addition, as a result of a bilateral agreement between France and Germany to study reprocessing, and the budgetary pressure of German reunification, the Karlsruhe Nuclear Research Center has shut down its R&D work on reprocessing FBR fuel.

In the recycling area, Germany has a mature mixed-oxide program, including MOX fabrication facilities at Hanau and extensive experience in MOX fuel operation. German utilities and Siemens/KWU planned and developed this capability beginning in 1980. The industry has demonstrated the feasibility of recycling second-generation plutonium separated from spent MOX fuel, as well as the recycling of enriched reprocessed uranium.

Although Germany has abandoned its domestic R&D and industrial plans for reprocessing, it continues to participate in technology development with the French. Recently, Germany has become part owner of the UP3-800 reprocessing facility at LaHague, France. In addition, extensive plans and demonstrations for plutonium and uranium recycling with MOX fuels are underway. With France, the UK, and Italy, Germany is one of the principle contributors to the European Fast Reactors Utilities Group.

India

India is committed to a closed fuel cycle and has operated reprocessing facilities for over twenty-five years. Four reprocessing plants are currently in operation or under construction. India's first plant, a demonstration facility at Trombay, was commissioned in 1964 with a capacity of 50 MTHM per year. A 100 MTHM-per-year plant at Tarapur was commissioned in 1985. Phase I of the Kalpakkam plant has a capacity of 125 MTHM per year and Phase II has a capacity of 1,000 MTHM per year. In 1991, India also began offering reprocessing services for research reactor spent fuels as part of a larger effort to export the country's nuclear technology and consultant services worldwide.

China

In the 1950s, the Chinese received Soviet technology and assistance on nuclear fuel reprocessing, then proceeded domestically to build reprocessing facilities for military purposes at Subei in Gansu Province. A long-term research and development program preceded the decision to build a 26 MTHM-per-year reprocessing pilot plant at Lanzhou in the Gansu Province; this new plant is scheduled to start operations in 1998. In addition, two commercial-scale reprocessing facilities are scheduled for completion in 1995 and 2000 in the Zhejiang and Xinjiang Provinces. The Chinese approach to developing reprocessing

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technology has been a careful, thorough process, developed over a long period of time. It represents a studied choice of reprocessing and recycling plutonium and uranium to make efficient use of the material, as well as the geographical and labor resources of China.

Other Countries

Other countries committed to reprocessing that have relatively small reprocessing facilities under construction, operating, or shut down include Belgium, Italy, and Argentina. Six more countries have selected the reprocessing cycle, but have no domestic reprocessing capability: Bulgaria, Czech and Slovak Federal Republic, Hungary, Finland, The Netherlands, and Switzerland.

COUNTRIES NOT USING REPROCESSING

USA

The USA is committed to the once-through, or open nuclear fuel cycle, followed by storage and disposal. No commercial reprocessing plants are in operation today, although reprocessing facilities for military purposes that began operating in the early 1950s at Hanford, Washington; Savannah River, South Carolina; and Idaho Falls, Idaho, are still in operation. The Nuclear Fuel Services (NFS) plant at West Valley, New York, operated from 1967 to 1972, reprocessing 600 MTHM of spent fuel. The plant was to have been expanded to a 750 MTHM-per-year capacity, but instead was shutdown by NFS in 1972 as uneconomic. In the same time period, a prototype plant was built and tested by General Electric at Morris, Illinois, but never began operation due to technical problems and the lack of need for reprocessing. In 1976, following a federal ban on commercial reprocessing due to proliferation concerns, Allied-General ceased work on a plant at Barnwell, South Carolina, that had progressed to the operating license stage. Exxon performed two feasibility studies for 1,500 MTHM-per-year plants, neither of which reached the construction stage.

Nuclear utilities in the USA operated from 1957 to 1977 under the assumption that the plutonium in their spent fuel had a positive cash value and rate payers were given credits long before utilities could expect income from plutonium. Since reprocessing and recycling never occurred, the plutonium benefits never came about. A federally financed study of reprocessing and recycling in the early 1970s favored recycling, but the 1976 ban ended the reprocessing of civilian spent fuel. The ban was lifted in 1981, but the lack of facilities to utilize reprocessed uranium and plutonium made reprocessing a non-viable commercial business. No private firm in the USA has since ventured into commercial reprocessing.

Although the USA has selected the once-through commercial fuel cycle over reprocessing, little progress seems to have been made on spent fuel disposal. No permanent repository for spent fuel exists in the USA, nor does any interim, centralized storage facility exist, in spite of many years of planning for a permanent geological repository and a monitored retrievable storage facility. Spent fuel continues to be stored by utilities on site in upgraded spent fuel pools inside the reactor containment buildings, but this storage space is limited. Some utilities have built on-site storage facilities outside the containments, but such storage is becoming more difficult to license. By the late 1990s, US utilities may be faced with the choice of sending spent fuel overseas for reprocessing or shutting down nuclear units.

Canada and Sweden

Canada and Sweden are other examples of countries utilizing nuclear power, but not using reprocessing. Canada is committed to the CANDU heavy water reactor technology that uses natural uranium fuel. The economics of reprocessing depleted uranium from HWRs has long been non-viable, thereby dictating Canada's decision not to reprocess.

Initially, Sweden elected the reprocessing option, providing funds for the development of the UP3 facility in France, and signing contracts to have its spent fuel reprocessed. However, Sweden reversed its decision and has now elected to follow an open fuel cycle with permanent disposal of the country's spent fuel. This decision resulted primarily from proliferation concerns, as well as ecological concerns regarding nuclear wastes.

Several other countries also have not committed to reprocessing and have opted for interim storage until a final decision is reached. **Table 2** lists the spent fuel management approaches in some selected countries.

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Table 2
SPENT FUEL MANAGEMENT BY COUNTRY

Country	Interim Storage	Reprocessing	Permanent Disposal
Argentina	●	■	
Belgium		■	
Brazil	●		
Bulgaria		■	
Canada			▼
China		■	
Commonwealth of Independent States		■	
Czech and Slovak Federal Republic		■	
Finland	●	■	
France		■	
Germany	●	■	
Hungary		■	
India		■	
Italy		■	
Japan		■	
Mexico	●		
Netherlands		■	
Pakistan	●		
Slovenia	●		
South Africa	●		
South Korea	●		
Spain	●		
Sweden			▼
Switzerland		■	
United Kingdom		■	
USA			▼

Source: *International Atomic Energy Agency*

CONCLUSION

Reprocessing of spent nuclear fuel is a relatively simple, well-developed, and successful technology. Large, expensive reprocessing facilities are in use, principally in the UK and France, and are under construction in Japan and the CIS. As in most industrial processes, the viability of the process depends on the usefulness of its function and products, operational costs, and the economics of waste disposal. The current situation for nuclear fuel reprocessing is that the products—plutonium and reprocessed uranium—are not economical to use. There are insufficient facilities in place to fabricate and use the plutonium as fuel, and there is little use for reprocessed uranium as long as fresh uranium remains inexpensive. The result is that most of the plutonium and uranium from reprocessing is stored temporarily, waiting to be recycled as fuel or possibly to be disposed of permanently. Also, plutonium and uranium from proposed dismantlement of nuclear weapons threaten to increase temporary storage stockpiles.

In addition to the storage of plutonium and reprocessed uranium, the high-level waste (HLW) from reprocessing must be stored temporarily as well, since no permanent HLW disposal facilities have been built, in spite of available and proven technology. Spent nuclear fuel in the open nuclear fuel cycle also is being stored temporarily at reactor sites, awaiting the construction of the same HLW disposal facilities. The current temporary storage of the products of both the closed and the open nuclear fuel cycles cannot go on indefinitely, and reprocessing cannot be justified given the current lack of need for its products. To alleviate these end-of-fuel-cycle problems, two solutions are needed: permanent HLW disposal provisions and increased plutonium utilization. Plutonium will be used when MOX fuel is fabricated and burned in LWRs, and when plutonium-using fast breeder reactors are built. HLW disposal will be accomplished once permanent disposal facilities can be sited, constructed and licensed. These two solutions apply worldwide and must be implemented at national levels in order to maintain fuel cycle options and to assure the viability of the nuclear electric power industry.

Charles E. Foreman

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NUCLEAR INDUSTRY CALENDAR

1992	
June 23-24	***Nuclear Forum '92*** (Royal Garden Hotel, London, United Kingdom). Sponsored by the British Nuclear Forum. Contact: Ms. Ipek Yigit, Manager for Public and Industrial Affairs, British Nuclear Forum; phone: 071-828-0116; Fax: 071-828-0110; Address: 22 Buckingham Gate, London, SW1E 6LB, England.
Sept. 9-11	***Uranium Institute 17th Annual Symposium*** (London, United Kingdom). Contact: 44-71-225-0303; Fax: 44-71-225-0308.
Sept. 20-23	***International Uranium Seminar '92*** (Hyatt Regency Hotel, Lake Tahoe, Nevada). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 21-23	***2nd International Conference on Training for Operation & Maintenance in the Nuclear Industry*** (The Moat House International Hotel, Stratford-upon-Avon, United Kingdom). Sponsored by the Institution of Nuclear Engineers. Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.
Sept. 29- Oct. 1	***Crisis/Emergency Information Planners' Workshop*** (Loews L'Enfant Plaza, Washington DC) Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Oct. 18-22	***AMC Mining Convention*** (Las Vegas, Nevada) Sponsored by the American Mining Congress. Contact: AMC Convention Office; 202-861-2800; Fax: 202-861-7535.
Oct. 19-23	***International Symposium on Geological Disposal of Spent Fuel, High-level and Alpha-bearing Wastes*** (Antwerp, Belgium). Sponsored by the International Atomic Energy Agency. Contact: IAEA, P.O. Box 100, A-1400 Vienna, Austria.
Nov. 15-18	***International Nuclear Energy Forum*** (Fairmont Hotel, Chicago, Illinois). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Nov. 15-20	***American Nuclear Society Winter Meeting*** (McCormick Center Hotel, Chicago, Illinois). Contact: ANS Meetings Department; 708-352-6611.

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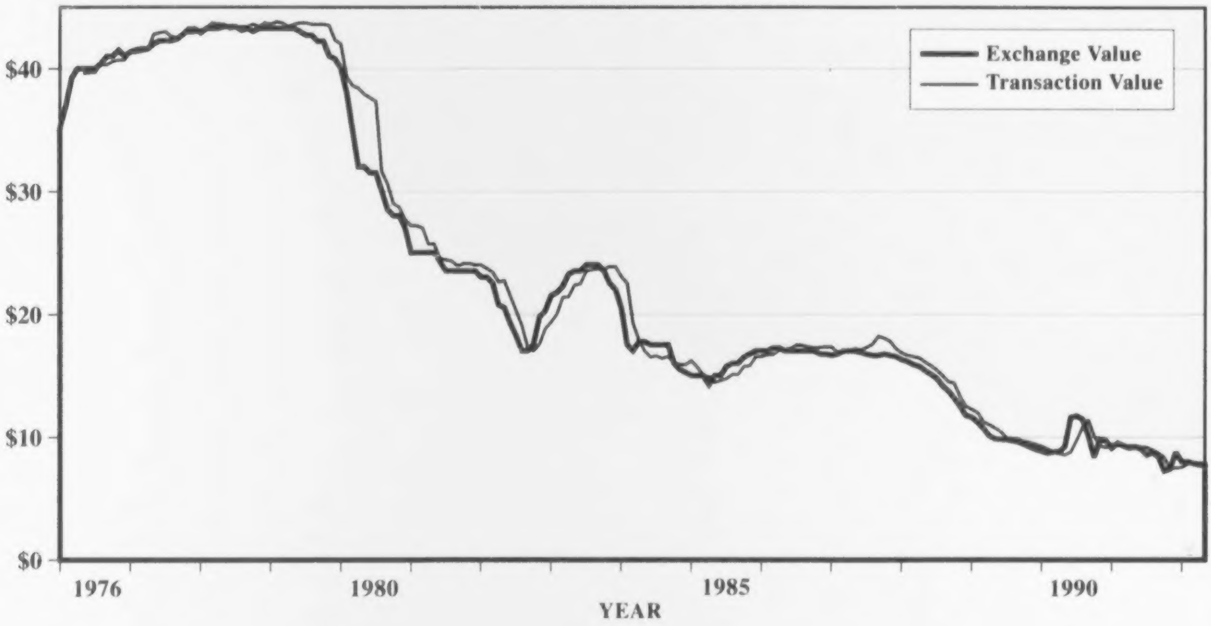
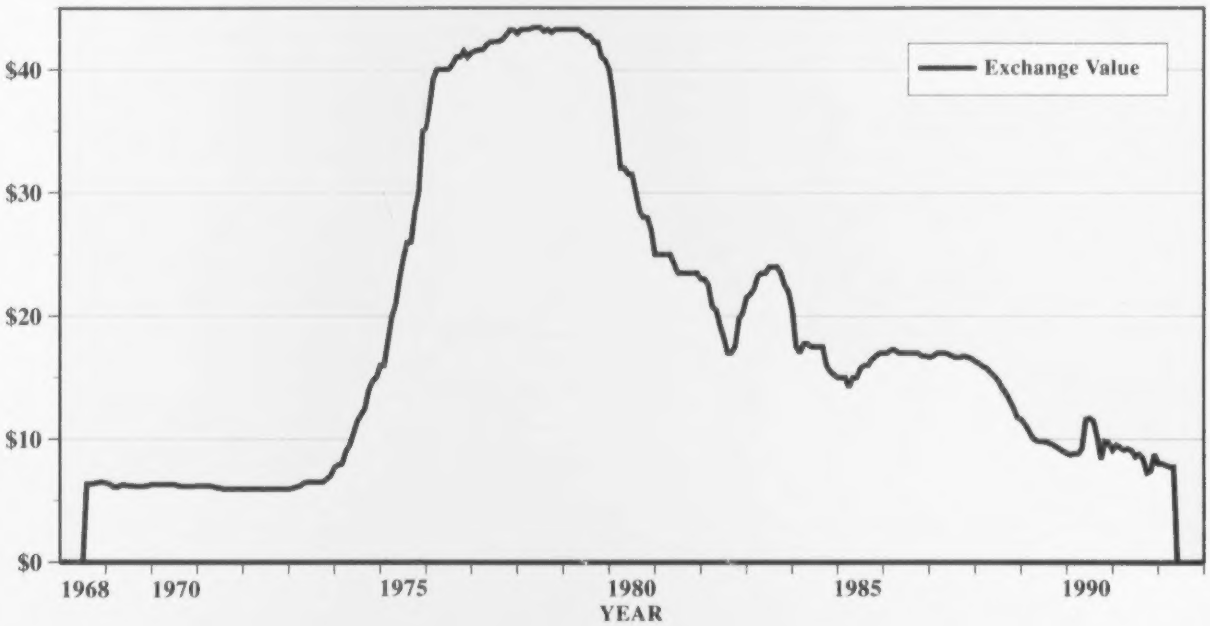
NUEXCO HISTORICAL EXCHANGE VALUE AND TRANSACTION VALUE

(in US dollars per pound U_3O_8)





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HISTORICAL MARKET VALUES

Exchange Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.90	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	9.80	9.70
1991	9.10	9.50	9.30	9.10	9.20	9.05	8.55	8.75	8.40	7.25	7.40	8.75
1992	8.00	8.00	7.85	7.75	**7.75**							

US Premium (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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HISTORICAL MARKET DATA

UF₆ Values

Determined as of the last day of the month indicated ($US/kg U as UF₆)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29 50	24.75	28.75	28.75
1991	27.50	27.75	27.50	27.25	27.60	27.25	25.75	26.25	25.50	22.75	22.75	26.00
1992	24.50	24.25	24.00	23.75	**23.60**							

US Premium (Relative to the UF₆ Value)

Determined as of the last day of the month indicated ($US/kg U as UF₆)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

Conversion Values

Determined as of the last day of the month indicated ($US/lb U as UF₆)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
1991	1.45	1.45	1.45	1.45	1.50	1.50	1.50	1.60	1.55	1.55	1.55	1.55
1992	1.60	1.60	1.60	1.60	**1.60**							

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Transaction Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	9.30	9.15
1991	9.40	9.45	9.35	9.30	9.30	9.20	9.15	8.95	8.70	8.35	7.45	7.50
1992	7.55	7.80	7.95	7.90	**7.85**							

SWU Values

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	51	51
1991	51	50	52	52	54	59	66	67	67	68	68	70
1992	71	70	69	67	**65**							

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Loan Rates

Year	Determined as of the last day of the month indicated (Percent per Annum)											
	Jan	**Feb**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1991	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.00
1992	3.00	3.00	3.00	3.00	**3.00**							

* Float with Prime Rate

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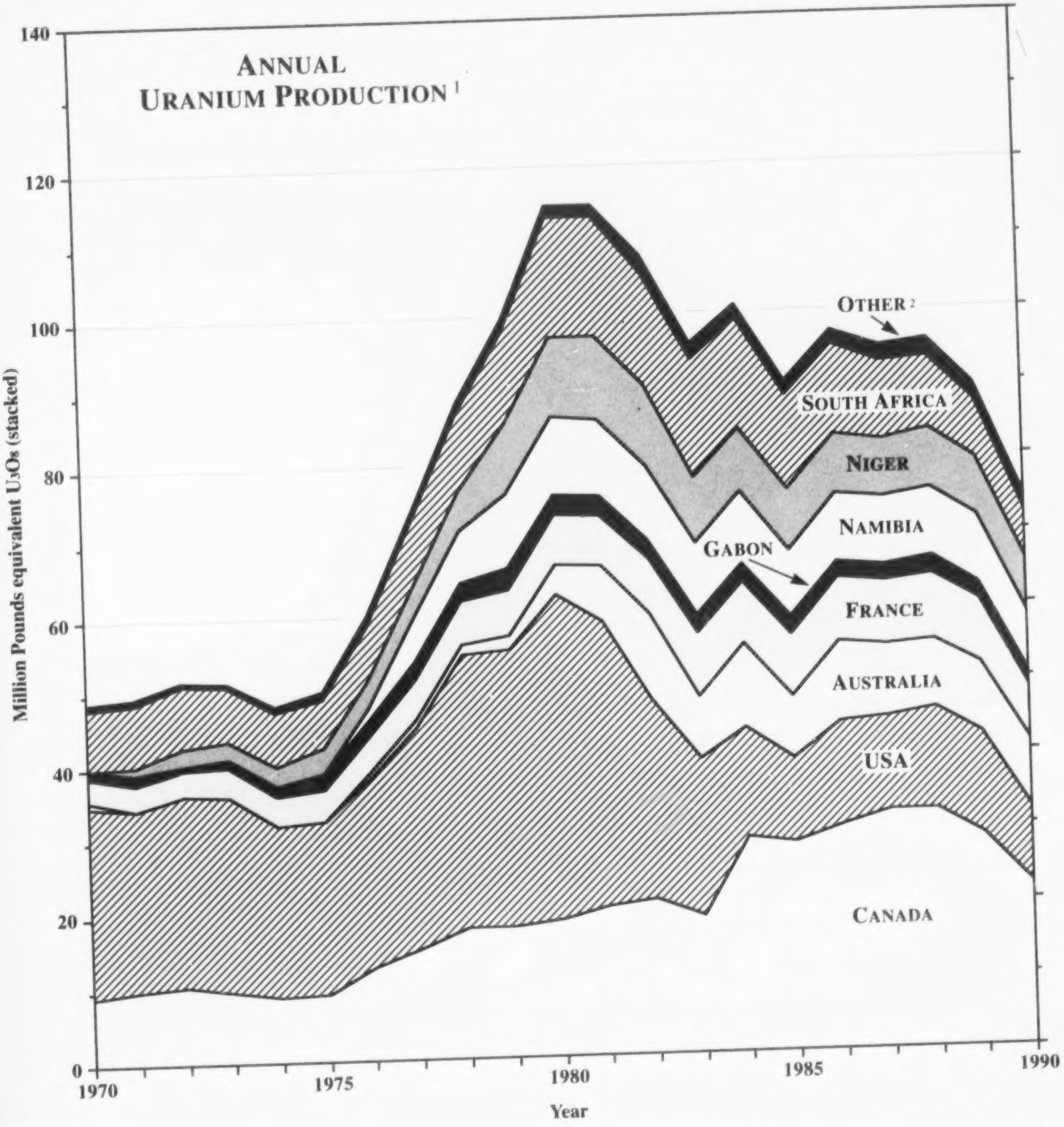

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[1] Estimated western world uranium production in 1990 totalled 74.5 million pounds equivalent U_3O_8 — (Australia: 9.1 – Canada: 22.0 – France: 7.4 – Gabon: 1.8 – Namibia: 8.0 – Niger: 7.4 – South Africa: 6.4 – USA: 10.2 – Other[2]: 2.2)

[2] **Other** includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, former West Germany, and Yugoslavia (Slovenia).

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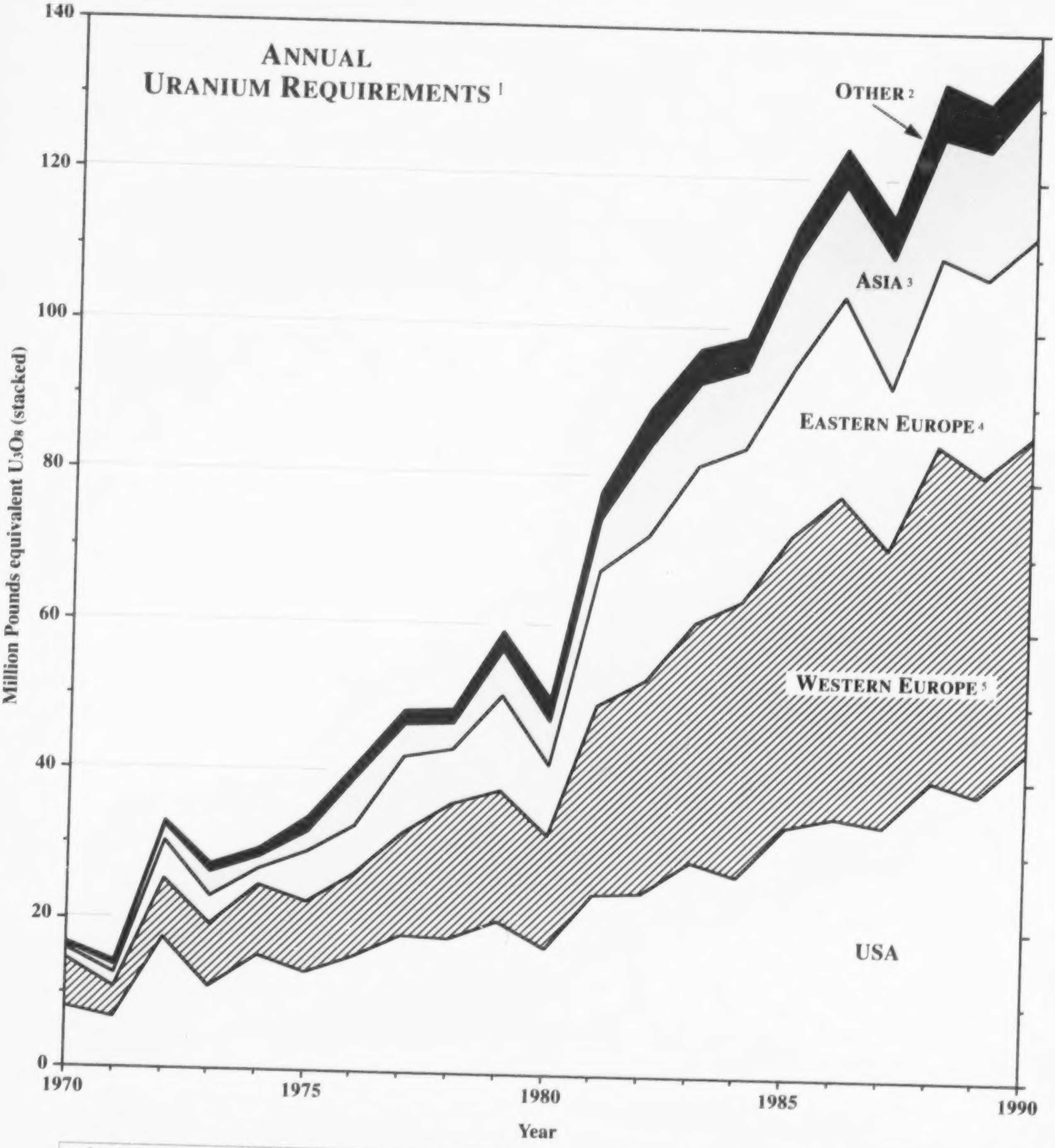
HISTORICAL MARKET DATA



[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assay.
[2] **Other** includes: Argentina, Brazil, Canada, India, Mexico, Pakistan, and South Africa.
[3] **Asia** includes: Japan, People's Republic of China, South Korea, and Taiwan.
[4] **Eastern Europe** includes: Bulgaria, Czechoslovakia, former East Germany, Finland, Hungary, former Soviet Union, and Yugoslavia (Slovenia).
[5] **Western Europe** includes: Belgium, France, former West Germany, Italy, The Netherlands, Spain, Sweden, Switzerland, and UK.

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Australia

Year	Period[1]	Consumer Price Index[2] (1989/1990 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia[4] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[5] (June 1985 = 100)
1980	Avg.	47.4 **R**	83.1	—	69.6
1981	Avg.	51.9 **R**	85.9	—	76.1
1982	Avg.	57.7 **R**	89.0	—	86.4
1983	Avg.	56.9 **R**	96.9	—	89.9
1984	Avg.	66.0 **R**	98.0	—	96.0
1985	Avg.	70.5 **R**	107.3	—	100.0
1986	Avg.	76.9 **R**	101.5	—	104.9
1987	Avg.	83.4 **R**	108.9	465.88	112.9
1988	Avg.	89.4 **R**	111.8	496.90	115.4
1989	Avg.	96.2 **R**	117.0	534.65	126.0
1990	Avg.	103.2 **R**	123.4	571.43	129.7
1991	Avg.	106.5 **R**	120.1	600.35	133.8
Jan	1991	—	125.6	—	133.0
Feb	1991	—	121.5	597.70	133.0
Mar	1991	105.8	119.1	—	133.3
Apr	1991	—	117.6	—	133.5
May	1991	—	117.8	592.00	133.5
June	1991	106.0 **R**	120.4	—	133.5
July	1991	—	120.4	—	133.6
Aug	1991	—	119.9	599.50	133.9
Sept	1991	106.6 **R**	118.3	—	134.2
Oct	1991	—	118.7	—	134.2
Nov	1991	—	120.6	612.20	134.4
Dec	1991	107.6 **R**	121.2	—	134.4
Jan	1992	—	120.9	—	134.6
Feb	1992	—	120.9	—	—
Mar	1992	107.6	120.0		

P = Preliminary **R** = Revised since last month

[1] Monthly data for the period 1967 to 1990 appears in NUEXCO Monthly Report 278.

[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1989 to June 1990 = 100.0). Figures shown at end of quarter represent quarterly average. Base year changed from 1980/81 in Monthly Report 286.

[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (CATALOGUE No. 6411.0).

[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (CATALOGUE No. 6312.0). Figures for the latest fourteen months shown are subject to revision.

[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (CATALOGUE No. 6302.0).

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Canada

				Wage-earner Data: Average Hourly Earnings (C$)[4]				
Year	Period	Industrial Products Price Index: All Commodities[1] (1986 = 100)[2]	Consumer Price Index: All Items (1986 = 100)[3]	Uranium Mines (SIC 057)	Metal Mines (SIC 051-059)	Mines, Quarries and Oil Wells (SIC 051-099)	Metal Rolling, Casting and Extruding (SIC 298)	Chemicals and Chemical Products Industries (SIC 372-379)
1980	Avg.	75.9	67.2	—.—	—.—	—.—	—.—	—.—
1981	Avg.	83.6	75.5	—.—	—.—	—.—	—.—	—.—
1982	Avg.	89.0	83.7	—.—	—.—	—.—	—.—	—.—
1983	Avg.	92.1	88.5	17.22	14.86	14.18	10.67	11.09
1984	Avg.	96.3	92.4	17.89	15.85	14.97	11.11	11.68
1985	Avg.	99.0	96.0	18.53	16.47	15.56	11.85	12.12
1986	Avg.	100.0	100.0	19.38	16.70	15.76	12.28	12.58
1987	Avg.	102.8	104.4	20.12	17.15	16.11	12.58	13.20
1988	Avg.	107.2	108.6	20.91	18.51	16.95	13.17	13.77
1989	Avg.	109.4	114.0	21.97	20.02	18.41	13.71	14.16
1990	Avg.	109.7	119.4	22.90	20.93	19.12	14.62	15.28
1991	Avg.	108.7	126.2	24.35	22.27	20.28	14.83	16.45
Jan	1991	111.1	125.0	23.79	21.79	19.78	14.66	15.89
Feb	1991	110.6	125.0	25.23	22.45	20.13	14.63	16.10
Mar	1991	109.8	125.5	24.19	22.22	20.27	15.21	16.47
Apr	1991	109.1	125.5	24.77	22.50	20.31	14.63	16.64
May	1991	108.6	126.1	24.38	22.17	20.25	15.05	16.55
June	1991	108.5	126.7	23.58	22.13	19.90	14.65	16.51
July	1991	108.2	126.8	24.70	22.33	19.93	14.56	16.36
Aug	1991	107.8	126.9	23.78	22.01	20.00	14.62	16.24
Sept	1991	107.6	126.7	24.23	22.27	20.38	14.89	16.47
Oct	1991	107.3 **R**	126.5	24.40	22.26	20.53	15.06	16.55
Nov	1991	107.2 **R**	127.0	24.58	22.44	20.79	14.85	16.62
Dec	1991	107.1 **R**	126.4	24.53	22.70	21.13	15.16	17.04
Jan	1992	107.2	127.0	24.79	22.67	21.20	15.53	16.97
Feb	1992	108.0	127.1	24.42 **R**	22.51 **R**	21.15 **R**	15.92 **R**	16.86 **R**
Mar	1992	108.2 **R**	127.5	24.92 **P**	22.87 **P**	21.21 **P**	15.85 **P**	16.70 **P**
Apr	1992	107.9	127.6	—.—	—.—	—.—	—.—	—.—

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (CATALOGUE 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1990 is found in NUEXCO Monthly Report 278.

[2] New Base Year of 1986 as of NUEXCO Monthly Report 266. Previous Base Year was 1981.

[3] New Base Year of 1986 as of NUEXCO Monthly Report 264. Previous Base Year was 1981.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1990 is found in NUEXCO Monthly Report 278.

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South Africa

Year	Period	Average Declared Working Costs per Metric Ton of Gold Ore Milled[1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled[2] (March 1982 = 100)	Consumer Price Index[3] (1990 = 100)	Production Price Index All Groups[4] (1990 = 100)	Total Employment in Mining and Quarrying[5]	Total Salaries and Wages in Mining and Quarrying[5] (1,000 Rand)
							Annual Total[6]
1980	Avg.	35.50	—	25.5	27.7	709,042	2,237,689
1981	Avg.	41.87	—	29.4	31.5	722,918	2,756,928
1982	Avg.	47.23	103.9	33.7	35.9	702,041	3,181,584
1983	Avg.	51.88	115.0	37.8	39.7	700,901	3,563,282
1984	Avg.	58.95	130.3	42.2	43.0	711,511	4,134,390
1985	Avg.	68.70	151.7	49.1	50.3	724,587	4,778,612
1986	Avg.	80.18	177.9	58.2	60.1	756,637	5,767,950
1987	Avg.	95.01	223.1	67.6	68.5	751,864	6,911,395
1988	Avg.	106.69	241.1	76.2	77.5	705,355	7,774,054
1989	Avg.	116.65	273.0	87.4	89.3	700,360	8,833,934
1990	Avg.	129.37	305.3	100.0	100.0	677,742	10,193,209
1991	Avg.	136.06	322.4	115.2	111.4	630,722	10,934,073
							Monthly Total
Jan	1991	—	—	107.7	108.6	648,944	935,839
Feb	1991	—	—	109.0	109.0	650,948	893,373
Mar	1991	137.66	323.82	110.0	108.2	651,843	924,930
Apr	1991	—	—	111.5	108.8	639,939	887,722
May	1991	—	—	113.2	109.8	630,481	887,107
June	1991	134.65	317.23	114.0	110.3	640,908	890,595
July	1991	—	—	115.5	111.2	637,581	881,182
Aug	1991	—	—	117.1	112.0	633,699	963,710
Sept	1991	137.11	329.05	118.7	113.2	639,535	1,014,424
Oct	1991	—	—	119.8	114.8	584,435	860,529
Nov	1991	—	—	120.9	115.3	602,461	853,864
Dec	1991	134.81	319.33	122.5	115.8	602,486	940,798
Jan	1992	—	—	125.1	115.9	—	—
Feb	1992	—	—	126.2	116.3	—	—
Mar	1992	139.69	331.46	127.3	116.9	—	—
Apr	1992	—	—	128.9	—	—	—

P = Preliminary **R** = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in NUEXCO Monthly Report 278.

[2] Page 16 of Report 178 contains description and calculation of index.

[3] Central Statistical Service, Pretoria: All income groups-weighted average, Historical Data by month appears in NUEXCO Monthly Report 278.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa. Base Year changed from 1985 to 1990 in NUEXCO Monthly Report 284.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in NUEXCO Monthly Report 236.

[6] Annual total is shown, rather than monthly average, for indicated year.

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United States

Year	Period	Producer Price Index[1] Industrial Commodities (1982 = 100)	Producer Price Index[1] All Commodities (1982 = 100)	Consumer Price Index[2] (1982-1984 = 100)	GNP Implicit Price Deflator[3] (1987 = 100)	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4] Metal Mining (SIC 10)	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4] Primary Non-ferrous Metals (SIC 333)	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4] Chemicals and Allied Products (SIC 28)	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4] Electric and Electronic Equipment (SIC 36)
1980	Avg.	88.0	89.8	82.4	71.7	10.26	10.63	8.31	6.94
1981	Avg.	97.4	98.0	90.9	78.9	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	83.8	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	87.2	12.58	13.43	10.58	8.66
1984	Avg.	103.3	103.7	103.9	91.0	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	94.4	13.38	13.74	11.57	9.46
1986	Avg.	100.0	100.2	109.6	96.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	100.0	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	103.9	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	108.4	13.59	13.72	13.09	10.05
1990	Avg.	115.8	116.3	130.7	112.9	14.10	14.36	13.54	10.32
1991	Avg.	116.5	116.5	136.2	117.0	14.89	14.64	14.07	10.73
Jan	1991	119.3	119.0	134.6	—	14.73	14.63	13.85	10.60
Feb	1991	117.2	117.2	134.8	—	14.80	14.55	13.81	10.59
Mar	1991	115.6	116.1	135.0	115.9	14.93	14.55	13.85	10.55
Apr	1991	115.6	116.0	135.2	—	14.85	14.56	13.96	10.63
May	1991	116.1	116.5	135.6	—	14.79	14.52	14.01	10.66
June	1991	116.1	116.4	136.0	116.8	14.88	14.51	14.05	10.74
July	1991	116.0	116.1	136.2	—	15.09	14.56	14.16	10.77
Aug	1991	116.3	116.2	136.6	—	14.82	14.64	14.06	10.78
Sept	1991	116.3	116.1	137.2	117.4	15.04	14.59	14.21	10.84
Oct	1991	116.7	116.4	137.4	—	14.94	14.75	14.25	10.78
Nov	1991	116.7	116.4	137.8	—	15.29	14.89	14.27	10.88
Dec	1991	116.1	115.9	137.9	117.9	15.13	14.87	14.34	10.96
Jan	1992	115.6	115.6	138.1	—	15.06	14.74	14.30	10.90
Feb	1992	116.0	116.1	138.6	—	15.22 **R**	14.67 **R**	14.29	10.90 **R**
Mar	1992	115.9	116.1	139.3	118.8	15.16 **P**	14.54 **P**	14.31 **R**	10.94 **R**
Apr	1992	116.3	116.3	139.5	—	—·—	—·—	14.46 **P**	11.00 **P**

P = Preliminary **R** = Revised since last month

[1] US Bureau of Labor Statistics, Washington, DC: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents Historical data is presented in NUEXCO Monthly Report 278.

[2] US Bureau of Labor Statistics, Washington, DC: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in NUEXCO Monthly Report 278.

[3] US Department of Commerce, Washington, DC: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted. Historical data is presented in Report 278. Base Year change from 1982 to 1987 in NUEXCO Monthly Report 284.

[4] US Bureau of Labor Statistics, Washington, DC: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in NUEXCO Monthly Report 278.

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Uranium Deliveries To The European Community[1]

— Compiled from data published by the Euratom Supply Agency —

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price		Spot Contracts[3] Average Price	
			in ECU per pound U_3O_8	in US Dollars per pound U_3O_8	in ECU per pound U_3O_8	in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19
1990	12,800	16.7	ECU 23.08	$29.39	ECU 7.60	$ 9.68

P = Preliminary **R** = Revised since last month

[1] The twelve European Community member nations are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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US Uranium Marketing Data

— Compiled from data published by the US Energy Information Administration[1] —

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers[2] (million pounds U_3O_8)	Average Price of Delivered Uranium[2] ($/lb. U_3O_8)	Quantity of Uranium Imported[3] (million pounds U_3O_8)	Average Price of Imported Uranium ($/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	$16.10	3.6	n/a	1.2
1977	29.9	27.8	$19.75	5.6	n/a	4.0
1978	37.0	31.6	$21.60	5.2	n/a	6.8
1979	37.5	33.0	$23.85	3.0	n/a	6.2
1980	43.7	35.0	$28.15	3.6	$43.10	5.8
1981	38.5	32.6	$34.65	6.6	$32.90	4.4
1982	26.9	23.5	$38.37	17.1	$25.19	6.2
1983	21.2	24.2	$38.21	8.2	$26.16	3.3
1984	14.9	22.5	$32.65	12.5	$21.86	2.2
1985	11.3	21.7	$31.43	11.7	$20.08	5.3
1986	13.5	18.9	$30.01	13.5	$20.07	1.6
1987	13.0	20.8	$27.37	15.1	$19.14	1.0
1988	13.1	17.6	$26.15	15.8	$19.03	3.3
1989	13.8	18.4	$19.56	13.1	$16.75	2.1
1990	8.9	20.5	$15.70	23.7	$12.55	2.0

P = Preliminary **R** = Revised since last month

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity.*
1984-1990: Energy Information Administration, *Uranium Industry Annual.*

[2] Data for 1976-1981 includes both domestic utilities and agents.

[3] Includes imports by domestic utilities and domestic suppliers.

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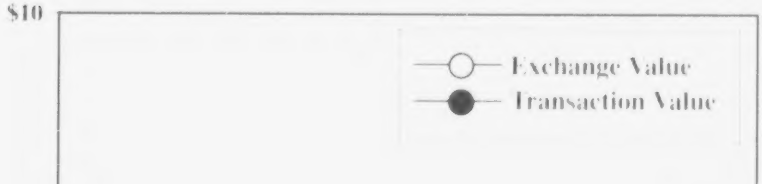

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MARKET REVIEW

Market Values Summary

NUEXCO Market Values	This Report June 30, 1992	Last Report May 31, 1992	12 Months Ago June 30, 1991
EXCHANGE VALUE[1]	**$7.75** / lb equivalent U_3O_8	$7.75	$9.05
UF_6 VALUE[2]	**$23.60** / kg U as UF_6	$23.60	$27.25
LOAN RATE[3]	**3.0%** / annum	3.0%	3.5%
CONVERSION VALUE[4]	**$1.50** / lb U as UF_6	$1.60	$1.50
SWU VALUE[5] (0.3 w/o tails assay)	**$65** / SWU	$65	$59
TRANSACTION VALUE[6]	**$7.80** / lb equivalent U_3O_8	$7.85	$9.20
Transactions	**26**	32	24
Months	**3**	3	2
Millions of Pounds	**6.0**	7.3	6.3

DEFINITIONS

[1] The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

[2] The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

[3] The **Loan Rate** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

[4] The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

[5] The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

[6] The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

- **a)** Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;
- **b)** At least ten transactions;
- **c)** Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.
- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.
- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight-percent (w/o) ^{235}U and a product assay of 3.0 weight-percent ^{235}U, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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JUNE MARKET REVIEW

(as of June 31, 1992)

OVERVIEW

Throughout the month of June, both buyers and sellers appeared somewhat indifferent to the preliminary determination on the anti-dumping petition released near the end of May. The June 30, 1992, Exchange Value remained unchanged at \$7.75 per pound U_3O_8. The UF_6 Value also was unchanged at \$23.60 per kgU as UF_6.

Ten near-term uranium transactions were reported during June, totalling more than five million pounds equivalent U_3O_8 (**Table 1**). Year-to-date uranium market volume now equals 22.4 million pounds equivalent U_3O_8 through 67 transactions. This level of activity is well ahead of 1991's half-year total of 13.5 million pounds in 57 transactions. A complete analysis of market activity during the first half of 1992 is provided in the article beginning on page 19 of this report.

The Loan Rate remained unchanged at 3.0 percent per annum. Three loans were reported, totalling more than four million pounds equivalent U_3O_8. The Conversion Value declined \$0.10, to \$1.50 per pound U as UF_6, as aggressive sellers continued to put downward pressure on the conversion market, particularly in the USA. Six near-term sales were reported during June, totalling more than four million pounds U of conversion services.

The SWU Value was unchanged at \$65 per SWU, as the enrichment market remained fairly stable during June. Four near-term enrichment sales were reported, totalling more than 600 thousand SWU. Three of these sales involved SWU contained in enriched uranium product (EUP). In addition, one long-term enrichment sale was reported for a large quantity of SWU for 1993-1997 delivery.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	June 1992		Year-to-Date	
	No. of Sales	Volume [1]	No. of Sales	Volume [1]
Concentrates	6	2.1	42	12.7
Natural UF_6	1	<0.1	15	5.1
EUP	3	3.1	10	4.6
Total [2]	**10**	**5.3**	**67**	**22.4**

[1] Million pounds equivalent U_3O_8

[2] Due to independent rounding, columns may not equal total.

NATURAL URANIUM AND CONVERSION

Spot market uranium prices stayed within a narrow range during June, and the **Exchange Value** remained unchanged at **\$7.75** per pound U_3O_8. As anticipated, market participants did not overreact to the preliminary dumping determination. When demand increased near the end of the month, due to four discretionary buyers entering the market within a few days, numerous suppliers continued to compete aggressively at levels near the June 30 Exchange Value, precluding any price increase.

The market was fairly active during June: six near-term concentrates transactions were reported, totalling nearly 2.1 million pounds U_3O_8. Utilities completed three of the June purchases; an intermediary and a uranium producer each made one. The other concentrates purchase was made by an intermediary from a producer, but it occurred earlier in 1992. Nearly all of the purchases were made by US-based companies.

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The **UF_6 Value** also was unchanged, remaining at **$23.60** per kgU as UF_6. The market for UF_6 was quiet in June, and experienced some slight downward pressure during the last half of the month as supply exceeded very limited UF_6 demand. Only one natural UF_6 transaction was reported, in which a US utility purchased a small quantity of UF_6 from an intermediary for near-term delivery.

* * *

In the **long-term uranium market**, four transactions totalling more than 3.7 million pounds equivalent U_3O_8 were reported. One utility committed to three suppliers, while an intermediary made the other purchase. All four sales involved concentrates and called for deliveries stretching from 1994 through 2004.

* * *

The **Transaction Value** decreased $0.05 for the third consecutive month, declining to **$7.80** per pound U_3O_8. This Value is based on 26 transactions over three months, involving 6.0 million pounds equivalent U_3O_8. The relative stability of the concentrates market during the past few months has caused the Transaction Value, which is calculated using a weighted, moving average, to approach the current Exchange Value of $7.75 per pound U_3O_8.

Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply[1]	Active Demand[1]
• Uranium (thousand lbs equivalent U_3O_8)	6,225	2,485
• Supply/Demand Ratio:	2.5	
• Loan (thousand lbs equivalent U_3O_8)	5,020	1,250
• Conversion (thousand lbs U as UF_6)	3,260	620
• SWU (thousand SWUs)	780	15

[1] Supply and Demand tables in the Market Review section of this report provide details for each category.

* * *

Active uranium supply dropped by 1.4 million pounds, to **6.2** million pounds equivalent U_3O_8 (**Table 2**). By month end, **active uranium demand** increased by almost one million pounds, to **2.5** million pounds equivalent U_3O_8. Nevertheless, supply has consistently emerged to meet new demand, and the **supply/demand ratio** of **2.5** illustrates that oversupply remains the dominant factor in the uranium market.

* * *

The **Loan Rate** remained unchanged at **3.0** percent per annum. Three loans were reported during June; intermediaries borrowed a total of more than four million pounds equivalent U_3O_8 from producers and a utility. All three loans could be evaluated to have occurred at a level near the prevailing Loan Rate.

* * *

The **Conversion Value** decreased $0.10, to **$1.50** per pound U as UF_6. While market conditions in Europe and the USA have created strong buyer's markets in both areas, prices are substantially higher in Europe. Suppliers have been particularly aggressive in the USA, putting even more downward pressure on the market there. In Europe, however, primary converters do not have much excess capacity and other sellers are not as active. Consequently, even though spot conversion demand is quite low in Europe, prices have not been under as much pressure as in the USA.

Six near-term transactions were reported: utilities and intermediaries purchased a total exceeding four million pounds U of conversion services from primary converters and an intermediary. Three of the sales occurred at prices slightly below the June 30 Conversion Value and three others occurred at prices higher than the June 30 Value.

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ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

The **SWU Value** was unchanged at **$65** per SWU, as the enrichment market stabilized during June. Market volume was notable, as four near-term sales totalled well over 600 thousand SWU. Three of the sales involved EUP, and contained more than 3.1 million pounds equivalent U_3O_8 of feed. The other near-term purchase was made by an intermediary for a small quantity of SWU at a price near the June 30 SWU Value. In addition, one long-term enrichment sale was reported, in which a European utility purchased a large quantity of SWU for delivery during the period 1993 through 1997.

Table 3
ENRICHMENT PRICES
(June 30, 1992)

Prices	This Month Report 287	Last Month Report 286	12 Months Ago Report 275
NUEXCO SWU Value ($US per SWU)	65	65	59
US DOE SWU prices: ($US per SWU)			
USC	121.50[1]	121.50[1]	117.85[2]
AFC	153.00[3]	153.00[3]	153.00[3]
Requirements	157.00[3]	157.00[3]	157.00[3]
Incentive Price (IP2)	104.67[4]	104.67[4]	100.68[5]
Calculated worth of enriched UF_6[6]: ($US per KgU as UF_6)			
2.0 $^{w}/_{o}$ ^{235}U	208	209	212
2.5 $^{w}/_{o}$ ^{235}U	291	292	294
3.0 $^{w}/_{o}$ ^{235}U	377	379	379
3.5 $^{w}/_{o}$ ^{235}U	465	467	466
4.0 $^{w}/_{o}$ ^{235}U	555	557	554
4.5 $^{w}/_{o}$ ^{235}U	646	648	643

[1] Effective 10/1/91.
[2] Effective 10/1/89 to 9/30/91.
[3] Effective since 10/1/84.
[4] Provisional IP2 for FY92: Effective 10/1/91 to 9/30/92, for up to 30% of annual requirements.
[5] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.
[6] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 $^{w}/_{o}$ ^{235}U tails assay.

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RECENT TRANSACTIONS

Uranium Sales [1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range [2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5383	1992	301-600	See remarks	Intermediary	Producer	Occurred earlier in 1992
5464A	1992	301-600	See remarks	Utility	Intermediary	Contained in EUP
5466	1992	101-300	90-97	Intermediary	Producer	
5468A	1992-1993	1,001-3,000	See remarks	Intermediary	**R**	Contained in EUP
5470	1995-2004	1,001-3,000	See remarks	Utility	Producer	Price related to market
5471	1995-2004	1,001-3,000	See remarks	Utility	Producer	Price related to market
5472	1995-1999	1,001-3,000	See remarks	Utility	Intermediary	Price related to market
5474	1992	Less than 50	98-102	Utility	Intermediary	
5475	1992	Less than 50	103-110	Producer	Intermediary	
5480	1994-1996	101-300	**R**	Intermediary	**R**	
5481	1992	Less than 50	98-102	Utility	Intermediary	UF_6
5484	1992	301-600	103-110	Utility	Intermediary	
5486	1992	601-1,000	98-102	Utility	**R**	
5490A	1992	101-300	See remarks	Intermediary	Utility	Contained in EUP

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Exchange Value or UF_6 Value. The endpoints of each range are included within that range.

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RECENT TRANSACTIONS

Natural Uranium Loans[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Loan Rate	Borrower	Lender	Remarks
5465	1992	101-300	**R**	Intermediary	Producer	
5467	1992	301-600	**R**	Intermediary	Producer	
5491	1992	3,001-6,000	98-102	Intermediary	Utility	

Conversion Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range[2] of Current Conversion Value	Buyer	Seller	Remarks
5476	1992	601-1,000	90-97	Utility	Converter	
5482	1992	Less than 50	90-97	Utility	Converter	
5483	1992	101-300	90-97	Utility	Converter	
5485	1992	601-1,000	Above 110	Intermediary	Intermediary	
5487	1992	1,001-3,000	Above 110	Intermediary	Converter	
5488	1993	1,001-3,000	Above 110	Intermediary	Converter	

Enrichment Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity[3] (thousand SWU)	Price Within Percentage Range[2] of Current SWU Value[4]	Buyer	Seller	Remarks
5464B	1992	101-300	See remarks	Utility	Intermediary	Contained in EUP
5468B	1992-1993	301-600	See remarks	Intermediary	**R**	Contained in EUP
5489	1993-1997	301-600	See remarks	Utility	Enricher	Base escalated
5490B	1992	50-100	See remarks	Intermediary	Utility	Contained in EUP
5493	1992	Less than 50	98-102	Intermediary	Intermediary	

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110,* represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., **X** dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

Uranium Supply

	Quantity (Thousand Pounds equivalent U_3O_8)			
NUEXCO Project Number	**Spot or Near-term[1]**	**Intermediate or Long-term[2]**	**Delivery Period**	**Remarks**
AVAILABLE FOR SALE:				
ACTIVE				
91-1505	1,250	—	1992	
91-1507	500	—	1992	
91-1511*	1,305	—	1992	UF_6/UF_6e
91-1512*	785	—	1992	UF_6e
92-1194*	200	—	1992	
92-1501A*	1,685	—	1992	UF_6e
92-1509*	500	—	1992	U_3O_8/UF_6
91-1268	—	600 per year	1992-1999	
TOTAL	**6,225**			
INACTIVE	**3,050**			
AVAILABLE TO LOAN:				
ACTIVE				
92-1072	1,600	—	1992	UF_6
92-1077	180	—	1992	UF_6
92-1114	390	—	1992	UF_6
92-1183*	350	—	1992	
92-1187*	250	—	1992	U_3O_8/UF_6
92-1195*	250	—	1993	
92-1503	2,000	—	1992	
TOTAL	**5,020**			
INACTIVE	**1,600**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: 92-1074, 92-1075, 92-1128, 92-1129, 92-1161

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SUPPLY AND DEMAND

Uranium Demand

	Quantity (Thousand Pounds equivalent U_3O_8)			
NUEXCO Project Number	**Spot or Near-term**[1]	**Intermediate or Long-term**[2]	**Delivery Period**	**Remarks**
INQUIRIES TO PURCHASE:				
ACTIVE				
92-1152A	15	—	1993	UF_6e
92-1158*	450	—	1992	
92-1188*	500	—	1992	U_3O_8/UF_6
92-1189*	500	—	1992-1993	
92-1196*	520	—	1992	
92-1197*	500	—	1992	
91-1184	—	350 per year	1993-1997	
91-1197	—	2,210	1992-1997	U_3O_8/UF_6
91-1267	—	915	1993	UF_6
91-1290	—	310 per year	1995-1999	U_3O_8/UF_6
92-1032	—	200 per year	1996-1998	U_3O_8/UF_6
92-1164A*	—	785 per year	1996-2001	UF_6e
TOTAL	**2,485**			
INACTIVE	**400**			
INQUIRIES TO BORROW:				
ACTIVE				
92-1505	500	—	1992	
92-1511	750	—	1992	
TOTAL	**1,250**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: 92-1015, 92-1127, 92-1153, 92-1140, 92-1144

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SUPPLY AND DEMAND

Conversion Supply and Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF_6) Within 3 Years [1]	Beyond 3 Years [1]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1500	400	—	1992	
91-1501	1,100	—	1992	
92-1507	1,100	—	1992	
92-1190*	660	—	1993	
TOTAL	**3,260**			
INACTIVE	*None reported*			
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1275	620	—	1992-1993	
92-1178*	—	3,300 per year	1992-1995	
TOTAL	**620**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: 92-1154

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SUPPLY AND DEMAND

SWU Supply and Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8)		Delivery Period	Remarks
	Spot or Near-term[1]	Intermediate or Long-term[2]		
AVAILABLE FOR SALE:				
ACTIVE				
91-1509	200	—	1992	
91-1515	200	—	1992	
92-1501B	130	—	1992	UF_6e
92-1124	250	250 per year	1992-1994	
TOTAL	**780**			
INACTIVE	*None reported*			
INQUIRIES TO PURCHASE:				
ACTIVE				
92-1152B	5	—	1993	UF_6e
92-1191*	10	—	1993	
90-1196	—	60 per year	1995 on	
91-1152	—	2,700	1995-2001	
92-1016	—	170 per year	1996-2006	
92-1164B*	—	180 per year	1996-2001	UF_6e
TOTAL	**15**			
INACTIVE	**140**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: *none*

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES[1]

Australia *to* Hungary	Australia (dollar)	Belgium (franc)	Canada (dollar)	China (renminbi)	CSFR (koruna)	EC (ecu)	Finland (markka)	France (franc)	Germany (mark)	Hungary (forint)
EXCHANGE VALUE										
per pound equivalent U_3O_8 as Concentrates										
This Month (June 30, 1992)	**10.36**	**243.02**	**9.29**	**42.39**	**210.80**	**5.77**	**32.17**	**39.73**	**11.81**	**595.66**
Last Month (May 31, 1992)	10.24	256.28	9.32	42.59	221.73	6.06	33.81	41.79	12.46	610.08
12 Months Ago (June 30, 1991)	11.81	337.31	10.33	48.44	—·—	7.98	38.81	55.55	16.39	—·—
per kg U as Concentrates										
This Month (June 30, 1992)	**26.92**	**631.81**	**24.16**	**110.21**	**548.03**	**14.99**	**83.64**	**103.29**	**30.71**	**1,549**
Last Month (May 31, 1992)	26.61	666.28	24.23	110.71	576.44	15.76	87.89	108.66	32.39	1,586
12 Months Ago (June 30, 1991)	30.70	876.93	26.87	125.93	—·—	20.75	100.90	144.41	42.62	—·—
UF_6 VALUE										
per kg U as UF_6										
This Month (June 30, 1992)	**31.53**	**740.04**	**28.30**	**129.09**	**641.92**	**17.56**	**97.97**	**120.99**	**35.97**	**1,814**
Last Month (May 31, 1992)	31.17	780.42	28.38	129.68	675.20	18.46	102.94	127.27	37.94	1,858
12 Months Ago (June 30, 1991)	35.55	1,016	31.12	145.86	—·—	24.04	116.86	167.25	49.37	—·—
TRANSACTION VALUE										
per pound equivalent U_3O_8 as Concentrates										
This Month (June 30, 1992)	**10.42**	**244.59**	**9.35**	**42.67**	**212.16**	**5.80**	**32.38**	**39.99**	**11.89**	**599.51**
Last Month (May 31, 1992)	10.37	259.59	9.44	43.14	224.59	6.14	34.24	42.33	12.62	617.95
12 Months Ago (June 30,-1991)	12.00	342.90	10.51	49.24	—·—	8.12	39.45	56.47	16.67	—·—
per kg U as Concentrates										
This Month (June 30, 1992)	**27.10**	**635.88**	**24.31**	**110.92**	**551.57**	**15.09**	**84.18**	**103.96**	**30.91**	**1,559**
Last Month (May 31, 1992)	26.95	674.88	24.54	112.14	583.88	15.96	89.02	110.06	32.81	1,607
12 Months Ago (June 30, 1991)	31.20	891.46	27.31	128.02	—·—	21.10	102.57	146.80	43.33	—·—
CONVERSION VALUE										
per pound U as UF_6										
This Month (June 30, 1992)	**2.00**	**47.04**	**1.80**	**8.21**	**40.80**	**1.12**	**6.23**	**7.69**	**2.29**	**115.29**
Last Month (May 31, 1992)	2.11	52.91	1.92	8.79	45.78	1.25	6.98	8.63	2.57	125.95
12 Months Ago (June 30, 1991)	1.96	55.91	1.71	8.03	—·—	1.32	6.43	9.21	2.72	—·—
per kg U as UF_6										
This Month (June 30, 1992)	**4.42**	**103.70**	**3.97**	**18.09**	**89.95**	**2.46**	**13.73**	**16.95**	**5.04**	**254.17**
Last Month (May 31, 1992)	4.66	116.65	4.24	19.38	100.92	2.76	15.39	19.02	5.67	277.68
12 Months Ago (June 30, 1991)	4.31	123.26	3.78	17.70	—·—	2.92	14.18	20.30	5.99	—·—
SWU VALUE										
per SWU at 0.30 w/o ^{235}U Tails Assay										
This Month (June 30, 1992)	**86.85**	**2,038**	**77.94**	**355.55**	**1,768**	**48.36**	**269.84**	**333.23**	**99.07**	**4,996**
Last Month (May 31, 1992)	85.84	2,149	78.17	357.17	1,860	50.83	283.53	350.54	104.48	5,117
12 Months Ago (June 30, 1991)	76.97	2,199	67.37	315.80	—·—	52.04	253.02	362.12	106.88	—·—

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[1] Calculated using currency exchange rates for the last business day of the month, as published in *The Wall Street Journal*.

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES[1]

Italy *to* United States	Italy (lira)	Japan (yen)	Netherlands (guilder)	S. Africa (comm. rand)	S. Korea (won)	Spain (peseta)	Sweden (krona)	Switzerland (franc)	Taiwan (dollar)	UK (pound)	USA (dollar)
EXCHANGE VALUE											
per pound equivalent U_3O_8 as Concentrates											
This Month (June 30, 1992)	**8,935**	**974.72**	**13.31**	**21.48**	**6,124**	**745.91**	**42.68**	**10.65**	**188.90**	**4.07**	**7.75**
Last Month (May 31, 1992)	9,381	989.28	14.03	21.94	6,194	776.79	44.88	11.29	190.89	4.24	7.75
12 Months Ago (June 30, 1991)	12,182	1,246	18.47	26.13	6,555	1,028	59.19	14.06	242.81	5.57	9.05
per kg U as Concentrates											
This Month (June 30, 1992)	**23,228**	**2,534**	**34.61**	**55.84**	**15,921**	**1,939**	**110.95**	**27.70**	**491.09**	**10.58**	**20.15**
Last Month (May 31, 1992)	24,390	2,572	36.47	57.03	16,102	2,019	116.67	29.35	496.28	11.01	20.15
12 Months Ago (June 30, 1991)	31,670	3,239	48.02	67.92	17,042	2,672	153.88	36.55	631.25	14.49	23.53
UF_6 VALUE											
per kg U as UF_6											
This Month (June 30, 1992)	**27,208**	**2,968**	**40.54**	**65.41**	**18,649**	**2,271**	**129.96**	**32.44**	**575.22**	**12.40**	**23.60**
Last Month (May 31, 1992)	28,568	3,013	42.72	66.80	18,860	2,365	136.65	34.37	581.30	12.90	23.60
12 Months Ago (June 30, 1991)	36,681	3,751	55.61	78.67	19,738	3,094	178.22	42.33	731.11	16.75	27.25
TRANSACTION VALUE											
per pound equivalent U_3O_8 as Concentrates											
This Month (June 30, 1992)	**8,992**	**981.01**	**13.40**	**21.62**	**6,164**	**750.72**	**42.95**	**10.72**	**190.11**	**4.10**	**7.80**
Last Month (May 31, 1992)	9,502	1,002	14.21	22.22	6,273	786.81	45.45	11.43	193.35	4.29	7.85
12 Months Ago (June 30, 1991)	12,384	1,266	18.78	26.56	6,664	1,045	60.17	14.29	246.83	5.67	9.20
per kg U as Concentrates											
This Month (June 30, 1992)	**23,378**	**2,550**	**34.84**	**56.20**	**16,024**	**1,952**	**111.66**	**27.87**	**494.25**	**10.65**	**20.28**
Last Month (May 31, 1992)	24,704	2,605	36.94	57.76	16,310	2,046	118.17	29.72	502.68	11.16	20.41
12 Months Ago (June 30, 1991)	32,195	3,292	48.81	69.05	17,324	2,716	156.43	37.16	641.71	14.73	23.92
CONVERSION VALUE											
per pound U as UF_6											
This Month (June 30, 1992)	**1,729**	**188.66**	**2.58**	**4.16**	**1,185**	**144.37**	**8.26**	**2.06**	**36.56**	**0.79**	**1.50**
Last Month (May 31, 1992)	1,937	204.24	2.90	4.53	1,279	160.37	9.26	2.33	39.41	0.87	1.60
12 Months Ago (June 30, 1991)	2,019	206.47	3.06	4.33	1,086	170.32	9.81	2.33	40.24	0.92	1.50
per kg U as UF_6											
This Month (June 30, 1992)	**3,812**	**415.91**	**5.68**	**9.17**	**2,613**	**318.28**	**18.21**	**4.55**	**80.60**	**1.74**	**3.31**
Last Month (May 31, 1992)	4,270	450.27	6.39	9.98	2,819	353.55	20.42	5.14	86.88	1.93	3.53
12 Months Ago (June 30, 1991)	4,451	455.19	6.75	9.55	2,395	375.49	21.63	5.14	88.72	2.04	3.31
SWU VALUE											
per SWU at 0.30 w/o ^{235}U Tails Assay											
This Month (June 30, 1992)	**74,937**	**8,175**	**111.66**	**180.16**	**51,363**	**6,256**	**357.93**	**89.35**	**1,584**	**34.15**	**65.00**
Last Month (May 31, 1992)	78,683	8,297	117.67	183.98	51,946	6,515	376.38	94.67	1,601	35.53	65.00
12 Months Ago ((June 30, 1991)	79,419	8,121	120.41	170.32	42,735	6,699	385.87	91.66	1,583	36.33	59.00

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[1] Calculated using currency exchange rates for the last business day of the month, as published in *The Wall Street Journal*.

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RECENT DEVELOPMENTS

France

Pechiney Sells Nuclear Assets and Cogema Buys UG

The French government announced on June 9 that Pechiney, the multi-national aluminum and packaging corporation, will sell all of its nuclear-related activities to Cogema and Framatome. The sale still requires employee and shareholder approval and is scheduled for completion in July; Pechiney will receive more than FF2 billion (US$ 400 million) from the asset transfer. The French government encouraged the sale as a means of reducing the number of major French operators in the nuclear industry, enabling the two remaining operators to compete more effectively internationally to the benefit of French industry.

With the sale, Cogema and Framatome will share between them the ownership of much of France's fuel cycle industry. In the front end of the cycle, Cogema will focus on uranium production, hexafluoride conversion, enrichment, and on transportation. Framatome's interests will be in the areas of fuel fabrication and zirconium tube manufacturing. The companies will work closely with each other to manage the businesses more effectively. Some of the companies sold by Pechiney to Cogema and Framatome will be operated as if there were an equal partnership between the two conglomerates, a condition which the sale agreement refers to as "closely associated". The diagram shown in **Figure 1** illustrates some of the important ownership interests of both companies and their relationship to one another.

The sale calls for Cogema to assume Pechiney's uranium mining interests in Canada, Gabon, and Niger, as well as its uranium hexafluoride business at Comurhex. Pechiney previously owned 51 percent of Comurhex, and Cogema, 49 percent. As a result of the sale, Cogema will own 100 percent of Comurhex, one of the largest uranium conversion companies in the world. The Comurhex conversion facilities at Malvesi and Pierrelatte, France, have a nameplate capacity exceeding 14,000 MTU per year. Cogema also will take control of Pechiney's share in the nuclear fuel transportation company, Transnucleaire.

Framatome will take over Pechiney's fuel fabrication and other nuclear metallurgy business. Franco-Belge de Fabrication de Combustible (FBFC), once owned by Pechiney and Cogema, will now be majority owned and operated by Framatome. FBFC has facilities in Pierrelatte and Romans, France, and Dessel, Belgium. Cerca, the Pechiney subsidiary responsible for fuel design and testing, also will become 51-percent owned by Framatome. Zircotube, a leading zirconium tube manufacturer, will be owned by Framatome, as will Pechiney's 15-percent share of the US joint venture, Babcock & Wilcox Fuel Company.

Cezus, a Pechiney subsidiary that produces zirconium and titanium, will be sold in two halves. The first half is included as part of the current asset sale—26 percent to Framatome and 24 percent to Cogema. Pechiney will sell the remaining 50 percent to Framatome and Cogema as of March 1995, at which time Framatome will become the operator.

In another industry consolidation, Cogema finalized its purchase of Urangesellschaft mbH (UG) of Germany, first announced in mid-January. All final approvals were received in early June, as Cogema purchased 70 percent of UG. PreussenElektra AG (PREAG), a wholly owned subsidiary of VEBA, will retain a 15-percent ownership share, and Steag AG, also controlled by VEBA, will own the other 15 percent. Cogema will benefit from UG's ownership interests in mining operations in Australia, Canada, Namibia, Niger, and the USA, as well as its joint venture with Techsnabexport of Russia, Internexco. UG's trading and brokerage activities will complement the business of Interuran, a European intermediary owned 75 percent by Cogema.

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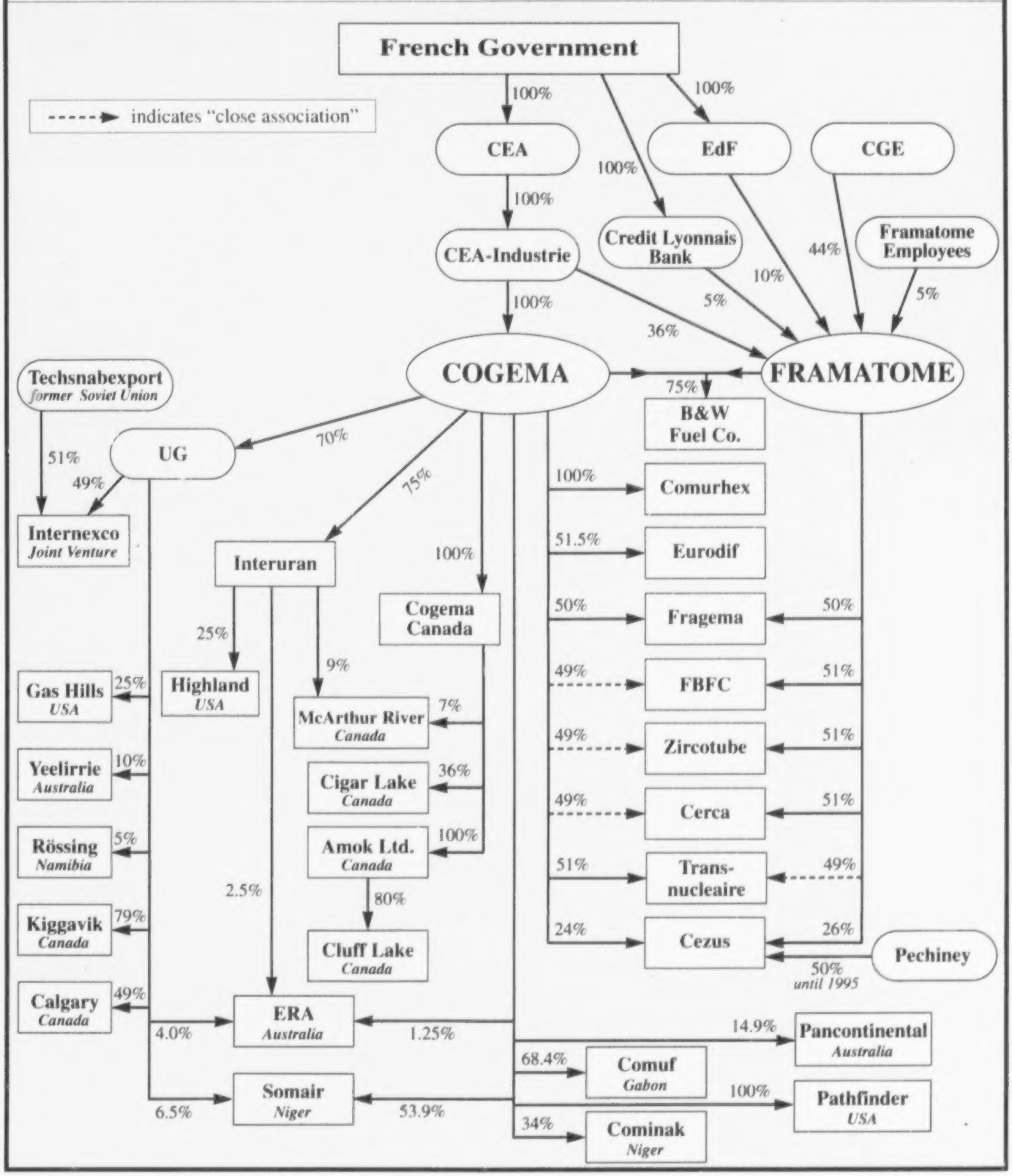
Figure 1
OWNERSHIP INTERESTS OF COGEMA AND FRAMATOME IN THE FRONT END OF THE FUEL CYCLE


French Government
indicates "close association"
100%
100%
100%
CEA
EdF
CGE
100%
Credit Lyonnais Bank
CEA-Industrie
Framatome Employees
44%
10%
5%
5%
100%
36%
COGEMA
FRAMATOME
75%
B&W Fuel Co.
Techsnabexport
former Soviet Union
51%
UG
70%
49%
Internexco
Joint Venture
75%
Interuran
100%
100%
Comurhex
51.5%
Eurodif
Cogema Canada
50%
Fragema
50%
25%
9%
Highland
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Gas Hills
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25%
49%
FBFC
51%
McArthur River
Canada
7%
49%
Zircotube
51%
Yeelirrie
Australia
10%
Cigar Lake
Canada
36%
49%
Cerca
51%
Rössing
Namibia
5%
Amok Ltd.
Canada
100%
51%
Trans-nucleaire
49%
2.5%
80%
Kiggavik
Canada
79%
Cluff Lake
Canada
24%
Cezus
26%
Pechiney
50%
until 1995
Calgary
Canada
49%
ERA
Australia
4.0%
1.25%
14.9%
Pancontinental
Australia
68.4%
Comuf
Gabon
100%
Pathfinder
USA
Somair
Niger
6.5%
53.9%
34%
Cominak
Niger

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WASHINGTON FOCUS

by Linda L. Gunter

With the Senate Finance committee mark-up of energy tax measures during June, some progress was made toward completion of Congressional consideration of a National Energy Policy bill. However, a major obstacle to a Senate vote is a "hold" placed on the bill by the Senators from Nevada, who object to provisions in the bill that allow the Department of Energy (DOE) to proceed with characterization of the spent fuel repository at Yucca Mountain, Nevada. Once those problems are resolved and the bill comes to the Senate floor for a vote, other Senators may propose amendments that could hurt the bill's chances for final agreement with the House version. On June 17, the House approved the FY1993 Energy and Water Appropriations bill that allocates money for DOE's nuclear research and development (R&D) programs, enrichment program, and spent fuel repository, as well as the Nuclear Regulatory Commission's (NRC) operating budget. Senate consideration of the Energy & Water Appropriations bill has not yet started, and is not scheduled for any time in the near future.

National Energy Bill

◇ The Senate Finance Committee met June 16 to mark up an amendment to the energy bill (S 2166) containing tax provisions similar to those approved by the House in its energy bill (HR 776). As part of the total amendment considered, Sen. Bill Bradley (D-NJ) had offered an amendment removing the tax depletion allowance currently permitted lead, mercury, uranium, and asbestos companies. His amendment was similar to one already in the House bill, but was defeated on a vote of 12-8. Although there was some speculation the committee might also consider the energy bill's provisions regarding the decommissioning and decontamination of the enrichment plants, there was no discussion of the issue. Progress toward final conference committee consideration of the House and Senate versions of the energy bill has been slow, and analysts estimate the Senate may not vote on the bill until after the July recess.

House Appropriations Bill

◇ On June 17, the House voted 365-51 to approve HR 5373, the bill appropriating funding for DOE and NRC programs for FY 1993. As the first major funding bill passed by the House this year, it confirmed predictions that FY 1993 will be a painful year for many programs, as fighting over a shrinking piece of the pie intensifies. If HR 5373 becomes law, the biggest loser would be the multi-billion dollar Superconducting Super Collider program, whose budget was reduced from its Appropriations Committee level of $483.7 million to zero, unless the program obtains $650 million in commitments from international sources prior to final consideration of the bill this year. The bill also institutes a one-year moratorium on nuclear weapons testing.

The appropriations bill would hold most of DOE's programs at current funding levels, with the environmental cleanup budget the only program to increase in size. DOE's nuclear programs would receive about $304 million, a $31 million reduction from FY1992 funding levels. Of the $304 million, almost $59 million would be authorized to fund the advanced light water reactor program, and $50 million would be allocated for advanced reactor research and development (R&D), including $12.5 million for R&D on the high temperature gas-cooled reactor. The spent fuel repository program would receive $275 million, a $117 million cut from DOE's budget request. In spite of the fact that the Nuclear

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Waste Fund, which consists of utility contributions to the repository program, has now accumulated over $3.4 billion and will grow by another $600 million during FY 1993, a DOE project manager indicated that, at current Congressional funding levels, the program will not meet its 2001 goal of licensing.

DOE's uranium enrichment program would receive $1.335 billion, based on estimated revenues of $1.462 billion. While the $1.335 billion is an increase from the $1.313 billion appropriation for FY 1992, it is less than DOE's FY 1993 budget request of $1.391 billion. The bill would allocate only $70 million to the AVLIS budget, a reduction of $30 million from DOE's budget request, and $93.6 million from DOE's FY 1992 budget. Further, it would not allow DOE to begin collecting an environmental cleanup fee directly from utilities.

The bill would establish the NRC budget at $535.4 million, an increase of $26.6 million over FY 1992. The bill asks the NRC to expedite the reactor life extension review process and the process for certification of advanced light water reactor designs.

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INDUSTRY BRIEFS

Sequoyah Fuels Restarts UF_6 Operations

Sequoyah Fuels Corporation (SFC), a wholly owned subsidiary of General Atomics, Inc., received authorization from the US Nuclear Regulatory Commission (NRC) on June 12 to restart full conversion plant operations, including fluorination and UF_6 production. Following a routine maintenance outage in September 1991, the NRC, concerned about safety and environmental matters, blocked the restart of SFC's Gore, Oklahoma, facility. During an extended shutdown that continued until April 1992, Sequoyah Fuels addressed the NRC's concerns and met all scheduled deliveries. The facility has a nameplate capacity of 9,100 MTU annually.

◆ ◆ ◆

RTZ to Sell Its Majority Share in Rio Algom

RTZ Corporation of the UK announced on June 8 that it is selling its 51.5-percent interest in Rio Algom, Ltd., the Canadian mining firm. The sale of the 22.5 million common shares is being underwritten by ten Canadian securities firms and has been valued at C$362.3 million. RTZ cited potential conflict of interest concerns as the reason for the sale, as RTZ also owns 100 percent of Kennecott Corporation, another North American company with uranium mining interests.

Entergy and Gulf States to Merge

On June 8, Entergy Corporation of New Orleans, Louisiana, announced a $2.3 billion merger plan in which it will acquire Gulf States Utilities Corporation (GSU) of Beaumont, Texas. The plan calls for a new holding company to be formed to acquire all of the outstanding stock of GSU and Entergy. GSU stockholders will be paid $20 per share in cash or stock. The merger is expected to take 1 to 1½ years to complete and is subject to approval by shareholders, and federal and regulatory authorities, as well as being contingent on non-adverse settlement of litigation currently filed against GSU.

Entergy Corporation's wholly owned subsidiaries include Entergy Operations, Arkansas Power & Light, and Louisiana Power & Light. Entergy Operations has management and operating responsibility for four nuclear plants: Arkansas units 1 and 2, Grand Gulf 1, and Waterford 3. GSU operates and owns 70 percent of the River Bend nuclear station in Louisiana.

Cameco Acquires AGIP Resources

Cameco Corporation of Saskatoon, Canada, announced on June 11 that it had purchased 100 percent of AGIP Resources, Ltd., a subsidiary of AGIP Miniere S.p.A. of Italy, for C$49.75 million. AGIP Resources, which will be renamed Cameco Resources, Ltd., owns a ten-percent interest in the McArthur River uranium project, thereby effectively giving Cameco more than 56 percent ownership share in the project. The purchase further solidifies Cameco's position as a leader in the uranium industry and also fits AGIP's strategy of exiting the uranium and precious metals sector.

◆ ◆ ◆

Taiwan Renews Progress Toward 7th and 8th Units

Taiwan Power Company (Taipower) is once again able to progress toward building the country's seventh and eighth nuclear plants. A June 3 vote by the budget committee of Taiwan's Legislative Yuan to release US$316 million in funds frozen since 1986 was the last major hurdle preventing the renewal of plans to build two new 1,000 MW reactors at Yenliao in northern Taiwan. Taipower already has begun soliciting bids to select an in-house architect/engineer to assist in the process of procuring major equipment. Taipower plans to begin construction within three years, and have the two units operating by the years 2000 and 2001, respectively.

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CFE Considers Purchasing Shoreham Parts

Comisión Federal de Electridad (CFE) officials met recently with officials responsible for the decommissioning of Long Island Power Authority's (LIPA) Shoreham reactor. The meeting explored the possibility of LIPA's selling some reactor parts, such as motors, pumps, and valves, as well as reactor fuel to CFE for use in its Laguna Verde 2 plant. That plant, a 640-MWe boiling water reactor, is approximately three-quarters complete and is similar in design to the never-operated Shoreham unit. The discussions are still in the preliminary stages, and full compatibility of the parts and fuel still must be verified.

LLW Facility Receives City Approval

On June 3, the Martinsville, Illinois, city council approved a resolution that would permit a low-level radioactive waste (LLW) disposal facility to be sited within the city's borders. The successful vote is a major step forward in the efforts by the Central Midwest Compact Commission to site the facility. The facility will be built and operated by Chem-Nuclear Systems, Inc., once all approvals have been received. Chem-Nuclear will pay an annual "community benefit fee" of $2.15 million, adjusted for inflation, to operate the facility during its projected 50-year life. The agreement between the city of Martinsville and the Illinois Department of Nuclear Safety (IDNS) also dictates that only low-level waste produced in Illinois and Kentucky, the two members of the Central Midwest Compact, is permitted in the facility. No high-level waste, spent fuel, transuranic waste, or mill tailings are allowed at the site. The facility also will have a full-time LLW inspector, in addition to the IDNS inspector. The Central-Midwest Compact is one of the few compacts in the USA to make significant progress in siting a new LLW facility.

EdF shuts down St. Laurent A2

On May 27, Electricité de France (EdF) shut down permanently its St. Laurent A2 reactor in central France. The 450-MWe gas-cooled reactor (GCR) had been in commercial operation since 1971. The closure leaves Bugey 1 as the country's sole remaining GCR. The St. Laurent closure is the result of a 1988 decision by EdF directors to phase out all GCRs, and to concentrate exclusively on their standardized pressurized water reactor designs.

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FIRST HALF 1992 MARKET REVIEW

OVERVIEW

Despite uncertainty caused by the anti-dumping petition, market patterns during the first half of 1992 changed little from previous years. Multiple sellers have continued to chase limited demand for actual near-term requirements and fickle discretionary buyers. Activity in 1992 has been brisk, and market volume barely lags the record pace of 1990, surprising most market participants who had anticipated more moderate levels of spot market activity.

Through the end of June, near-term market volume equalled 22.4 million pounds equivalent U_3O_8 in 67 transactions. This rate convincingly outpaces the comparable 1991 activity of 13.5 million pounds in 57 transactions (**Table 1**). Notably, the average transaction size has decreased, indicating that as market prices have dropped below expectations month after month, discretionary buyers have become more cautious, and have tended to purchase smaller quantities to reduce the risk of making large purchases prior to another price decline.

The dominant event in 1992 thus far has been the anti-dumping petition filed against the former Soviet Union. In November 1991, several uranium producers with US operations, and members of the Oil, Chemical and Atomic Workers Union filed a petition with the US Department of Commerce alleging that uranium from the Soviet Union was being sold in the USA at less than fair value. The investigation became more complicated when the Soviet Union dissolved near the end of 1991, and the former Republics, who previously had little or no control over the marketing of their uranium, became independent nations.

Table 1
NEAR-TERM URANIUM SALES
1992 versus 1991–through June

	1992 – Jan.-June		1991 – Jan.-June	
	No. of Sales	Volume [1]	No. of Sales	Volume [1]
Concentrates	42	12.7	37	7.9
Natural UF_6	15	5.1	13	4.3
EUP	10	4.6	7	1.3
Total [2]	**67**	**22.4**	**57**	**13.5**

[1] Million pounds equivalent U_3O_8
[2] Due to independent rounding, columns may not equal total.

Initial market reaction to the filing caused a slight surge in demand that led to an uptick in the NUEXCO Exchange Value to $8.75 per pound U_3O_8 as of December 31, 1991. However, sellers readily continued to supply material, and prices slid below eight dollars per pound within a couple of months, as buyers recognized that supplies remained more than adequate. Thus, when, after several delays, the International Trade Administration of the Department of Commerce issued its preliminary determination on May 29, the primary market reaction was one of indifference. Demand remained moderate, supply ample, and neither buyers nor sellers significantly altered their market plans.

The NUEXCO UF_6 Value followed a pattern similar to that of concentrates, rising to $26.00 per kgU as UF_6 at the end of 1991, before falling once again to less than $24.00 per kgU by mid-year. During the first part of the year, demand for UF_6 was limited compared to that for concentrates, and by May, UF_6 was selling at an $0.18 discount from the sum of the values of its components. Consequently, buyers began to re-examine UF_6 supply options.

On January 31, 1992, the Conversion Value rose $0.05, to $1.60 per pound U as UF_6 reflecting a slight tightening of supply, and remained at that level until June 30, when it decreased to $1.50 per pound U in the face of aggressive selling. Market activity has been notable, with 15 near-term sales reported, totalling almost eight million pounds U of conversion services. The transactions have occurred at prices in a fairly wide range around the prevailing Conversion Value, primarily due to geographic differences.

The Loan Rate has remained unchanged at 3.0 percent per annum since the end of 1991. Activity in the loan market has been somewhat subdued compared to previous years, with only six natural uranium loans reported so far this year, totalling 5.7 million pounds equivalent U_3O_8.

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The SWU Value reached its recent peak of $71 per SWU on January 31, 1992, and since has declined steadily to the June 30, 1992, Value of $65 per SWU. Aggressive selling by a few suppliers pursuing only moderate demand led to the price decline. Seventeen near-term SWU and enriched uranium product (EUP) sales were reported, involving about 1.7 million SWU.

NATURAL URANIUM

Near-Term Market Activity

Spot market prices for uranium concentrates have stayed fairly stable for the past nine months, showing only one anomaly when the Exchange Value rose to $8.75 at the end of December 1991. Otherwise, from October 1991 through June 1992, the Exchange Value has remained between $7.25 and $8.00 per pound U_3O_8.

Near-term market activity has increased in 1992, with 42 concentrates sales reported, totalling 12.7 million pounds equivalent U_3O_8. This exceeds last year's level of 37 transactions for 7.9 million pounds. The relatively high level of activity is somewhat surprising; due to the record quantities purchased in 1990 and the preponderance of discretionary buying in 1991, demand for actual requirements was relatively low, and many market participants expected 1992 market volume to taper off in response. Perhaps because of the consistently low spot prices and because of early perceptions regarding the market impact of the anti-dumping petition, discretionary buying has continued at relatively high levels by both utilities and producers. Moreover, ample supplies have kept prices near record-low levels.

Several factors have contributed to the current market conditions.

Anti-dumping petition against the former Soviet Union—This investigation has been the most scrutinized event in the market throughout 1992. Speculation as to the outcome, the treatment of the former republics, the timing of the decision of the Department of Commerce (DOC), and the influence on the determination by political and government events, have all been widely discussed. Yet despite the complexity of the case, no major surprises have occurred. The affirmative preliminary determination released by the DOC on May 29 was not unexpected, with the preliminary dumping margin of 115.82 percent within the range expected by both defendants and plaintiffs.

The only notable response to the investigation and to the preliminary determination has been the relative non-reaction by the market. Having learned expensive, and sometimes embarrassing lessons in past attempts to anticipate price movements, market participants have watched recent events carefully, and have reacted cautiously.

Abundance of supply—Regardless of potential government-imposed barriers to free trade, the fact remains that there is a vast oversupply of uranium relative to demand. Further, additional new high-grade deposits in Saskatchewan, the liquidation of government stockpiles, and the concerted effort worldwide to dismantle nuclear weapons represents millions of additional pounds of uranium and reinforces market perceptions of abundant supply into the foreseeable future.

Buyer and seller behavior—The other important factor that has affected the market thus far in 1992 has been the market behavior of buyers and sellers: utility purchases have been greater than expected, and although the number producer sales is lower, intermediaries have remained aggressive. Despite the record levels of discretionary purchases the past few years, utilities remained active buyers during the first half of 1992, making approximately one-third of all purchases and consistently exceeding most analysts' expectations of buying activity.

While producer selling in the spot market typically has declined as prices declined, the current low prices have led producer spot sales activity toward record-low levels. In addition, as many producers have scaled back production, a larger share of any remaining production must be allocated to long-term delivery commitments, reducing any excess inventories available for near-term sales. Producers also may have held onto inventories in anticipation of higher prices as a result of the anti-dumping petition, although those higher prices have not materialized.

While the anti-dumping investigation has not disrupted market activity to any great extent, it has introduced a new element of uncertainty in the marketplace. The additional perceived risk is enough to cause some traditional buyers and sellers to become cautious. The result is that traders, the traditional risk-takers, have developed a larger role in the market. Intermediaries of some type have been involved as a buyer or seller in 62 of the 67 uranium transactions so far this year.

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Utility policy of reduced inventories—The decision by many utilities to reduce inventories has noticeably decreased demand for actual near-term requirements. Those utilities remain active in the market, but only on a discretionary basis. Thus, demand has, in aggregate, become increasingly price sensitive, and any tendency toward higher prices can be quickly negated by reductions in demand.

The level of UF_6 market activity has remained consistent with past years, accounting for 20-25 percent of near-term uranium market volume. Early in 1992, as the intense competition in the concentrates market created more attractive prices, most buyers opted to buy uranium in that form. During the second quarter, in the face of relatively larger supplies, competition in the UF_6 market increased. The UF_6 Value steadily decreased from $24.50 per kgU as UF_6 on January 31, to $23.60 per kgU on May 31. At that point, UF_6 was selling at an $0.18 discount from the sum of the values of its components, making UF_6 an attractive option to buyers. Limited demand kept the UF_6 market fairly quiet in June, and the UF_6 Value remained $23.60 per kgU on June 30.

Activity in both the UF_6 and concentrates markets demonstrates an emerging trend of lower average quantities per transaction. In 1990, an average near-term transaction was nearly 340 thousand pounds equivalent U_3O_8; in 1991, the average had fallen to 267 thousand pounds per transaction. Although the average (mean) volume per sale thus far in 1992 is 330 thousand pounds equivalent U_3O_8, this has been skewed upwards by two large sales by producers that totalled more than six million pounds equivalent U_3O_8. When these two near-term sales are removed from the calculation, the 1992 average transaction size falls to 248 thousand pounds.

The current trend toward smaller purchases probably reflects two factors, both related to today's historically low prices. Utilities making discretionary purchases have accounted for the majority of sales, but these buyers have seen prices fall consistently over the years, and are unwilling to risk a major purchase at another perceived market bottom. By making several smaller purchases, they are better able to diversify their risk. Another factor affecting the shrinking average transaction quantity is the growing role of producers as major buyers in the past few years and their current tendency to buy smaller lots more frequently, in order to match their specific delivery requirements under long-term contracts. This strategy permits the producer to minimize its market risk, when buying on the spot market to fulfill delivery commitments for contracts using market-related pricing terms.

Market Volume

Near-term volume through the first half of 1992 totalled 22.4 million pounds equivalent U_3O_8 in 67 transactions. This represents a 66 percent increase over 1991's level of 13.5 million pounds, and is the second-highest level ever for a first-half-year market volume, just behind 1990's record pace (**Figure 1**).

Given this year's high number of discretionary purchases caused by the low prices, this pace is unlikely either to continue or surpass 1990's record level unless the prices remain near their record-low levels. Nevertheless, 1992 could become the second-most active year in the history of the uranium spot market.

Buyers

Utilities have completed the most contracts thus far in 1992, accounting for 30 of the near-term purchases and 9.1 million pounds equivalent U_3O_8. Intermediaries have made 13 purchases totalling almost ten million pounds, and producers, 21 purchases totalling 3.3 million pounds. This represents a notable decline in the market share of producer buying compared to the previous two years. In general, the relative stability of spot market prices has made buyers less anxious and more comfortable waiting until delivery commitments or requirements dictate a purchase.

The 1992 near-term uranium market has been most active in the USA, as 79 percent of the purchase volume can be attributed to US buyers (**Figure 2**). European buyers have accounted for 14 percent. Canadian, Asian, Australian, and other buyers have combined to purchase the remaining seven percent.

Sellers

Sales activity in 1992 has been dominated by traders. Sales by intermediaries accounted for 55 percent of first half 1992 market volume. Producers were the next most active, concluding seven near-term sales totalling 9.2 million

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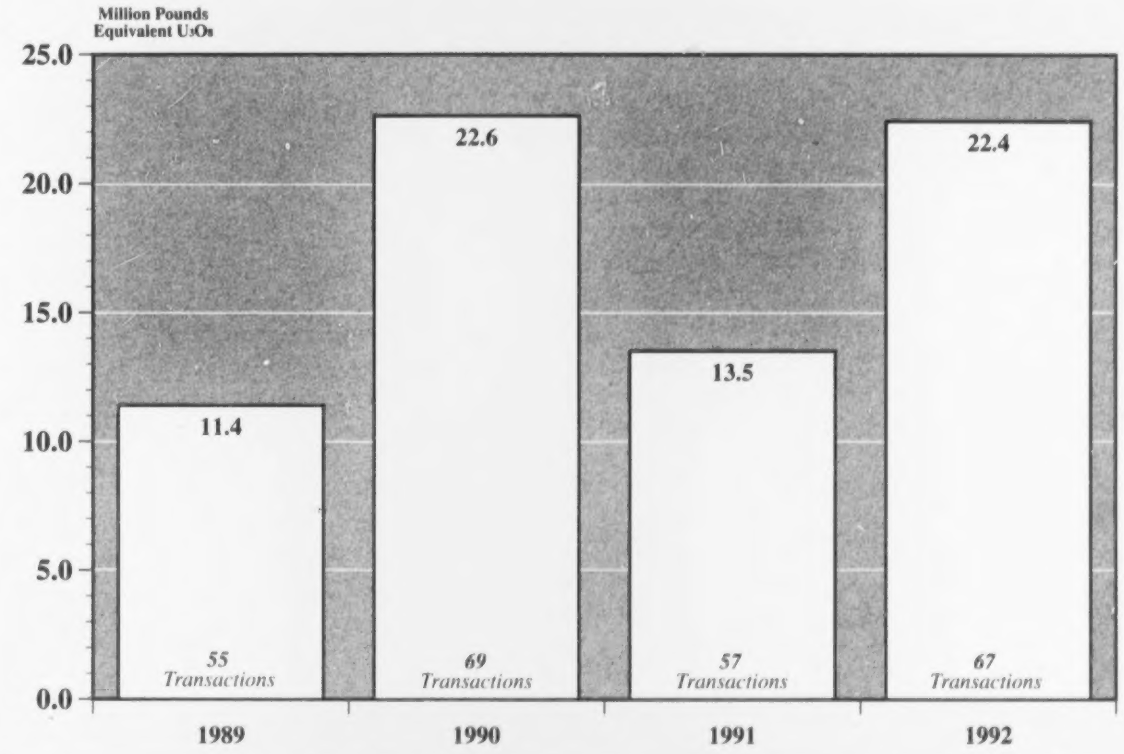
Figure 1
HISTORICAL FIRST HALF-YEAR URANIUM SALES VOLUME – 1989-1992



pounds equivalent U_3O_8 (41 percent), although this total would be nearer three million pounds were it not for the two large producer sales mentioned earlier. Other sellers this year included utilities, converters, fabricators, and unidentified entities. Overall, the number of sellers active in the market is down slightly, primarily because of the inactivity of producers, but the competition among the active sellers has been intense at times. The sellers have had abundant supplies available, and have priced material aggressively to compete for available demand.

US sellers have been the most active (45 percent), followed by European sellers including the CIS (34 percent). Other sellers have included entities from Asia, Canada, and Australia (**Figure 3**).

Long-Term Market Activity

After an active 1991, the pace of long-term uranium contracting has slowed somewhat. Through June, twelve long-term natural uranium transactions had been reported totalling approximately 15 million pounds equivalent U_3O_8, with deliveries ranging from 1992 through 2004. Ten of the sales involved concentrates; the others, UF_6. Utilities made 11 purchases and an intermediary, the other; sellers were almost equally split between producers and intermediaries. Market-related pricing terms were used in seven of the contracts. Base-escalated, fixed-price schedules, or complex price formulas combining different types of pricing mechanisms, were used in the other five sales.

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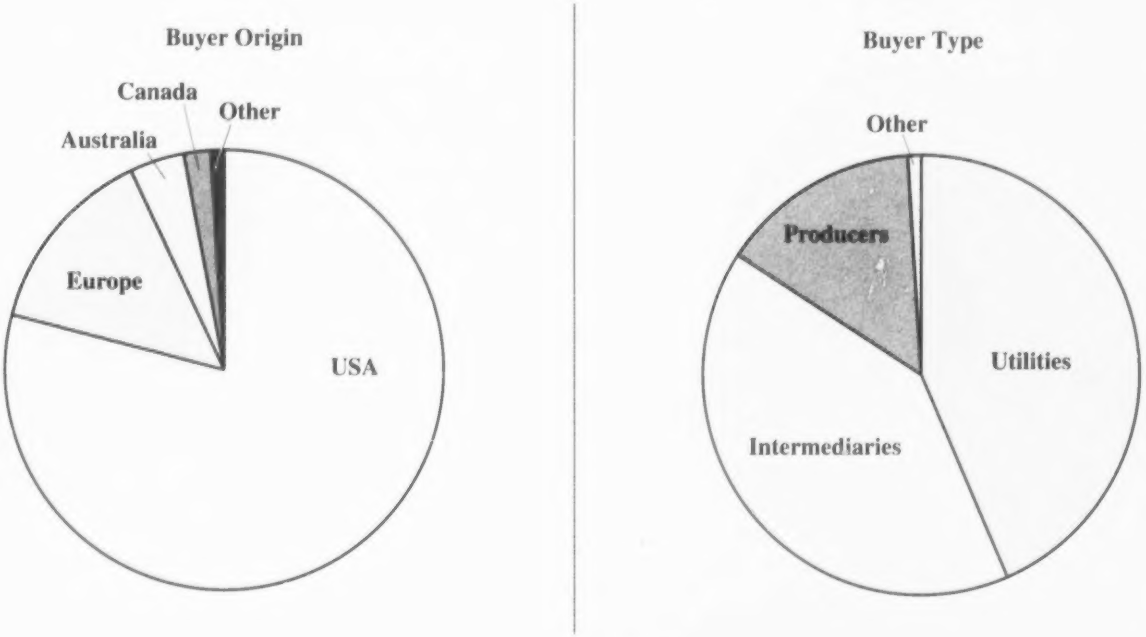
Figure 2
1992 NEAR-TERM URANIUM BUYERS
BY ORIGIN AND TYPE
(percent share by volume)



Interest in long-term contracting remains high, particularly in the USA, with many utilities attracted by historically low, relatively-stable prices, combined with other favorable commercial terms, including quantity flexibility, low ceiling prices, and an absence of floor pricing. Market-related pricing terms are still favored, but many utilities have begun to diversify their portfolios. Several utilities also have begun to lengthen their delivery windows. Some recent contracts have called for initial deliveries beginning in the mid- to late-1990s, with some final deliveries extending past the year 2000. This is a significant change compared to previous years, when spot market prices were falling continuously and utilities typically contracted nearer term and for shorter periods to protect themselves in the case of future price declines.

URANIUM LOANS

The Loan Rate has remained at 3.0 percent per annum since December 31, 1991. Overall, the loan market has been fairly quiet: only six natural uranium loans were reported in the first half of 1992, totalling approximately 5.7 million pounds equivalent U_3O_8. One large loan to an intermediary accounts for more than half of this year's loan volume. Intermediaries were the borrowers in all six 1992 loans, obtaining material from both utilities and producers. Comparatively, at this time in 1991, loan volume equalled 5.2 million pounds through eight loans.

Loan supply remained abundant, having ranged from 1.4 million to 10.6 million pounds equivalent U_3O_8 so far this year, and averaging more than 6.3 million pounds each month. However, loan demand has remained very low,

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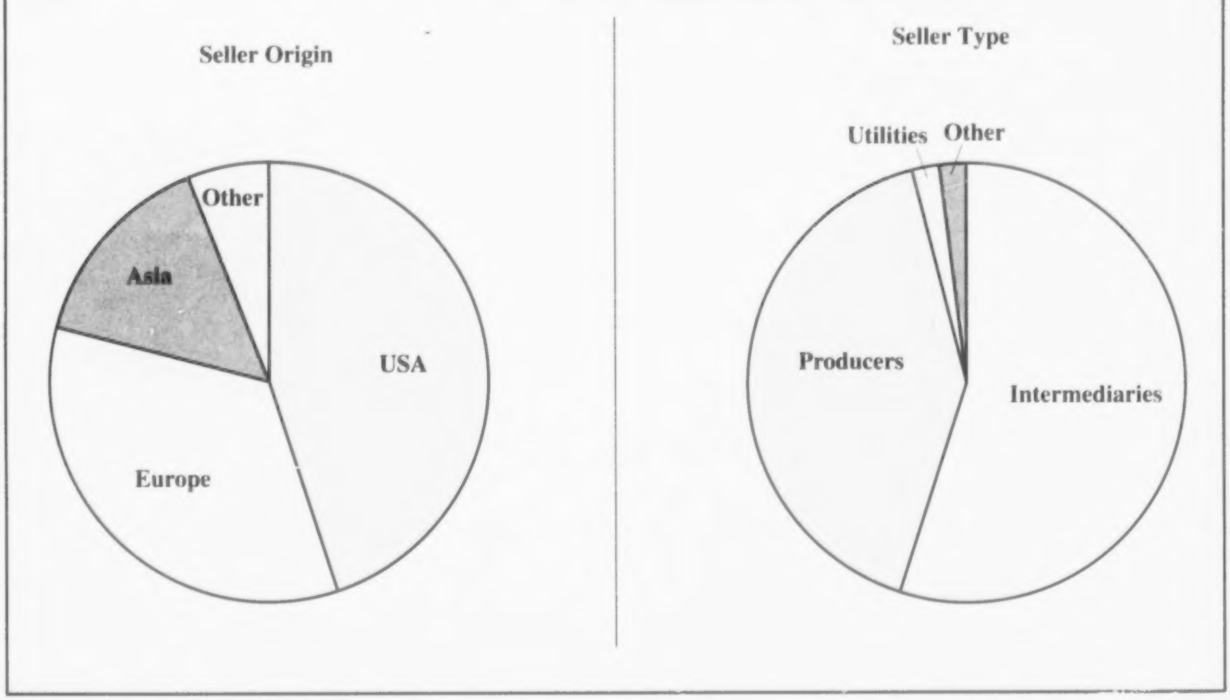
Figure 3
1992 NEAR-TERM URANIUM SELLERS
BY ORIGIN AND TYPE
(percent share by volume)



sometimes falling to zero. The low level of loan activity this year is a direct result of the low demand. The reduced level of demand is, itself, a reflection of the current price stability. Loans are most attractive when prices are falling—less attractive when prices are stable, rising, or expected to rise.

CONVERSION SERVICES

The NUEXCO Conversion Value rose $0.05 from its level of December 31, 1991, to $1.60 per pound U as UF_6 as of January 31, 1992, and remained at that level until June 30. It then decreased $0.10, to $1.50 per pound U as aggressive pricing by sellers put downward pressure on the conversion market, particularly in the USA. The conversion market has been quite active this year, particularly in the near-term market. Fifteen near-term conversion sales have been reported so far in 1992, totalling nearly eight million pounds U of conversion services. This compares to only six sales last year at this time and already exceeds the entire 1991 total of nine sales for less than two million pounds U.

Prices on near-term transactions varied considerably from the prevailing Conversion Value. While some transactions were concluded each month near the Conversion Value, others occurred both above and below this level. In general, prices tended to be higher in Europe and lower in the USA. Factors that contributed to the higher European conversion prices were higher levels of demand and the fact that the most active sellers were primary converters with little excess capacity and little incentive to offer aggressive

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pricing terms. In contrast, prices were lower in the USA, where primary converters had excess capacity and where several traders were active sellers.

In the long-term conversion market, activity thus far in 1992 has not kept up with 1991's record level—15 sales totalling 33 million pounds U during the year. Only two intermediate- and long-term sales have been reported so far this year, totalling approximately 3.5 million pounds U. Nevertheless, several utilities have been active in the market, as long-term conversion contracts have expired, and the excess UF_6 supplies overhanging the market in 1990 and early 1991 have largely dissipated.

ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

The SWU Value ended 1991 at $70 per SWU, rose to $71 per SWU on January 31, 1992, and has steadily declined to its current level of $65 per SWU. Despite some mismatches in timing between supply and demand that constricted supply and led to the late-1991 price increase, secondary SWU supply remains ample to meet demand. Aggressive competition among sellers is reflected by the recent price decline.

The near-term enrichment market has been fairly steady, as 17 SWU and EUP sales were reported through June, totalling approximately 1.7 million SWU. This is roughly equal to 1991's level of 18 sales of 1.5 million SWU during the same period. Seven of the 1992 transactions were for SWU only, while the remaining ten sales involved almost one million SWU and 4.6 million pounds equivalent U_3O_8 of feed contained in EUP. Utilities were the buyers in 12 of the sales, with intermediaries and fabricators comprising the balance. Intermediaries were the predominant secondary market sellers, providing material in eleven near-term sales. Primary enrichers, utilities, and unidentified entities sold the remainder.

The long-term enrichment market has had virtually no activity so far this year. Only one long-term SWU contract is known to have been concluded through June 1992. A European utility purchased a large quantity of SWU for delivery during the period 1993 through 1997. The major factor leading to this dearth of activity was the enormous level of long-term enrichment contracting that was concluded in 1991. That year witnessed the highest level of long-term contracting since the introduction of DOE's Utility Services Contract (USC) in the mid-1980s; 25 long-term enrichment transactions involving almost 9.5 million SWU were concluded, primarily during the second and third quarters.

In contrast, no major suppliers have aggressively entered the market this year, and few utilities have expressed interest in new long-term enrichment contracts. However, the large number of USC contract terminations in 1992 (37 utilities terminated 100 percent of their commitments for FY2002) and in 1991 (30 utilities terminated 100 percent for FY2000 and 31 utilities terminated 100 percent for FY2001), have resulted in many utilities, particularly in the USA, with uncommitted enrichment requirements near the turn of the century, foreshadowing another surge in contracting activity.

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BASIC CONSIDERATIONS

TRANSPORTING URANIUM FUELS;
REGULATION, LICENSING, AND DOCUMENTATION

This is part two of an article focusing on the transport of uranium fuels. Part one was published in the June 1992 Monthly Report no. 286 and dealt with the logistical aspects of this industry. This second part focuses on the licensing and documentation elements of uranium transport, primarily in the USA.

INTRODUCTION

The effort required to transport uranium between each stage of the fuel cycle, from the mills, to the converters, enrichers, and fabricators, is often unrecognized by many participants in the nuclear fuel industry. Yet to those directly involved in transport, it can be a labyrinth of logistics, regulations, procedures, and authorization.

The previous *Monthly Report* article reviewed the many considerations involving the different modes of transportation, samples and their shipping requirements, approved containers and protective packaging, shipment scheduling, and coordination of transportation services. The documentation requirements and regulations covering the movement of nuclear fuel and equipment is another major facet of the transportation system. The topic of US regulation of the uranium fuel transport industry is, in itself, quite extensive and involved. Therefore, this article addresses only the most common regulatory and documentation issues; the smaller details, special situations, and issues of insurance, are left for the professional transport manager to investigate.

LICENSES

For security reasons, no person may export or import nuclear equipment or material to or from the USA without a license issued by the US Nuclear Regulatory Commission (NRC). The Commission may grant an exemption to the licensing requirements if it determines that the exemption is authorized by law; does not endanger the country's security; and does not constitute an unreasonable risk to the public health and safety. NRC will only grant such an exemption after coordination with the Executive Branch of the US government. The exemption does not relieve any person from complying with the regulations of other government agencies having additional jurisdiction over exports or imports.

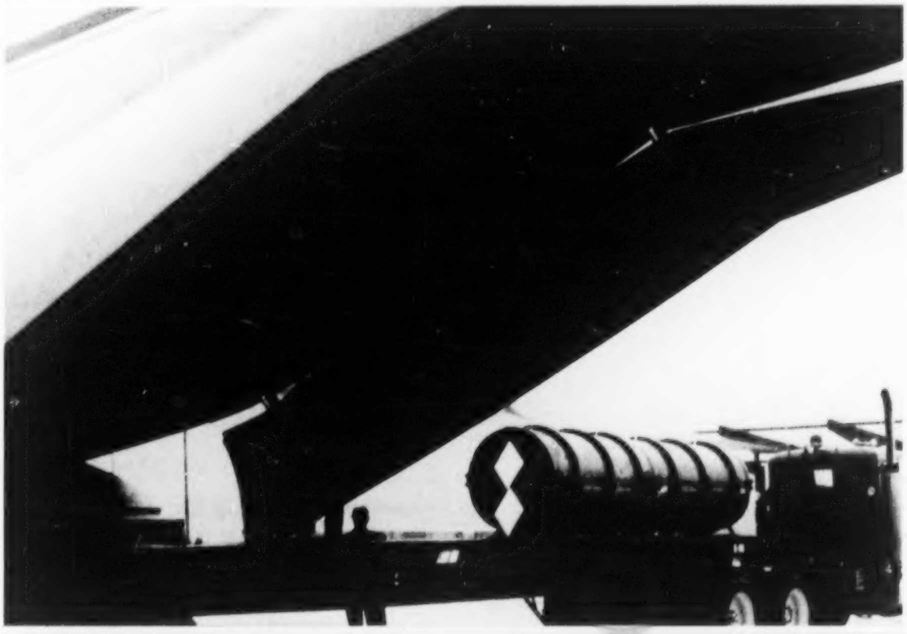

Figure 1 — Unloading Air Shipment. UF_6 30B cylinders in their protective shipping packages being unloaded from a cargo aircraft to a flatbed truck trailer.

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Materials Requiring Transport Licensing

Export items requiring a license are:

- Special nuclear material.
- Source material.
- Byproduct material.
- Deuterium.
- Nuclear-grade graphite.
- Nuclear reactors and their components or parts.
- Plants for the separation of the isotopes of source material, special nuclear material or lithium, and components of these plants.
- Plants for the reprocessing of irradiated nuclear reactor fuel elements and components for these plants.
- Plants for the fabrication of nuclear reactor fuel elements and specially designed or prepared parts and components for these plants.
- Plants for the production of heavy water, deuterium and deuterium compounds, and specially designed or prepared parts and components for these plants.

Import items subject to licensing are:

- Production and utilization facilities.
- Special nuclear material.
- Source material.
- Byproduct material.

Types of Licenses

The primary transport license NRC issues is called a **specific license**. The specific license authorizes a named person to export or import only a particular material to a designated destination/entity. The license has both time and quantity limitations. NRC's approval of this license is confirmed by the agency's issuance of a license certificate to the applicant.

Another form of license commonly used by NRC is the **general license** and is conferred by NRC regulation (that is, no certificate is issued). In nearly all situations, the regulatory authorization that confers the general license to transport is conditional upon the existence and terms of a specific license for that shipment, and generally licenses any person to perform transport services for the holder of the specific license. Performing under a general license, a person may import or export byproduct, source, or special nuclear material (except for irradiated fuel exceeding 100 kg per shipment) authorized by the specific license.

License Applications and Renewals

Applications for specific licenses are sent to the Assistant Director of International Security, Office of Governmental and Public Affairs, US Nuclear Regulatory Commission. To apply for a **license to export nuclear material and equipment**, an applicant must file Form NRC 7. To apply for a specific import license, the applicant must send a letter containing the required information. Import and export license requirements are outlined by the US Nuclear Regulatory Commission in the *Code of Federal Regulations (CFR)* under Title 10, Part 110 Import and Export of Nuclear Equipment and Material.

Before NRC will issue a specific license, it must be assured that the receiving/shipping country has knowledge of the shipment and agrees that the material being shipped will be used in accordance with bilateral safeguards agreements between that country and the USA. Since the bilateral agreements are administered by the Department of Energy (DOE), NRC sends a copy of a license application from a US entity to DOE, with a request that DOE obtain written authorization for the shipments from the foreign country. Depending upon US agreements with that country, DOE may contact the country directly to obtain the authorization, or may request the State Department to make the contact. When DOE obtains the authorization, it advises NRC that it approves the shipment. In general, this is the only governmental assurance required by NRC to issue a license. In special cases, such as unusually complex transactions or the movement of highly enriched uranium ($\geq 20\ ^{w}/_{o}\ ^{235}U$), the licensing staff of NRC may forward the application to the NRC commissioners for review.

When each import or export is completed, a record of the quantity and form of the material must be noted on the back of the original license. When the total quantity allowed by the specific license has been met, the license must be returned to NRC, indicating that the quantity limitation has been reached.

A license may be amended if a request is made to, and approved by, NRC. The license also may be renewed if it has not expired. If the renewal request is submitted thirty days or more before the license's time expiration, the time limit is suspended until NRC acts upon the renewal request.

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Retransfers

If material exported from the USA needs to be re-shipped from the receiving country to a third country and the third country is not on the original export license, this shipment is known as a retransfer or subsequent arrangement. The Nuclear Non-Proliferation Act of 1978 (NNPA) introduced the concept of the subsequent arrangement, although retransfers performed prior to the NNPA's enactment had always been handled in the manner prescribed by the NNPA. Before material exported under an NRC license can leave a country approved in the original export license, DOE must approve the transfer and be assured that the material will be moved to third country with which the USA has a bilateral safeguards agreement. For such a retransfer, an **approval for retransfer of special nuclear material of United States origin** (DOE Form MB#10) must be submitted to DOE by the US party to the original shipment. DOE proceeds much as it does in the original license application, by writing a letter to the embassy of the third country (the country that is the destination in the proposed retransfer), asking that country to confirm, in writing, that the material it is to receive will be subject to the terms and conditions of the bilateral agreement for nuclear cooperation, and that the party in the country that is to receive the material is authorized to do so.

Canadian Approval For Passage

The Canadian government requires anyone importing radioactive materials into Canada to obtain an **import license** from the Canadian Atomic Energy Control Board. Even if radioactive materials are planned only for shipment on a route which crosses the country's territorial boundaries, Canada requires that the Port Authority be notified at least 48 hours in advance, with such notification conferring a *de facto* **transit permit**.

US CUSTOMS SERVICE

All goods entering the USA must be examined by the US Customs Service, a division of the Department of Treasury. By law, Customs is allowed to open and examine all goods entering the USA, and in the case of radioactive materials, may require a sample of the material to be analyzed prior to release, to verify statements made on the entry paperwork. However, Customs normally examines only the paperwork and sometimes the external packages. If the agency has any questions about an entry of radioactive materials, it usually contacts NRC.

Since only a licensed customs house broker is permitted to perform transactions with the US Customs Service, a customs house broker must be hired at each port of entry and given power of attorney to act on the client's behalf. US Customs requires that a copy of the specific import/export license be on hand for examination, so lodging a copy of the license with the customs house broker hired for that port of entry is recommended. The customs house broker also uses the license number for the customs import/export documentation that he must complete.

Under Customs regulations, all goods coming into the USA must have forms and associated documentation to obtain a *formal entry* into the USA. A **consumption entry** is a type of formal entry under which goods can enter into the USA, and remain for use in the country. This form of entry also is used for imports when the transport agent has no knowledge of, or responsibility for, potential future export of the goods. If the goods are later exported, a claim may be made to Customs to recover the duties or fees paid at the time of entry. Goods imported for processing and then exported may be brought in on a **temporary import entry**, and thus avoid the customs user fee.

FEES

The Omnibus Reconciliation Act of 1986 created a new *ad valorem* user fee, called the **customs user fee**, to be paid by the importer of record to cover the processing expenses of each entry of merchandise for US consumption. The original user fee, valid until September 30, 1987,

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was 0.22 percent of the value of the merchandise. The Secretary of the Treasury has since determined, as he is authorized to do, that a new rate of 0.17 percent is appropriate. Also, due to conflicts between the *ad valorem* character of the fee and the international regulations of the General Agreement of Tariffs and Trade, the customs user fee is now capped at a maximum of $400.

Fee regulations exclude from payment of the customs user fee those articles classified in Schedule 8 of the Tariff Schedules, including US origin goods returning to the country and products imported from developing countries. It also exempts goods brought into the country under a temporary import bond or an instrument of international trade bond. (See Bonds section for definition.)

The Harbor Maintenance Revenue Act of 1986 imposed a **harbor maintenance fee** on any port use. The tax is 0.125 percent of the value of the imported commercial cargo and is used used to help fund harbor maintenance and services. The US Customs Service administers the fee in a manner similar to customs duties on imports. Thus, the harbor maintenance fee is only applicable to entries for US consumption and not to cargos entered under a temporary import bond or an instrument of international trade bond.

BONDS

Since at the time of entry, all fees and applicable duties are due to the US Customs Service, a bond is posted for all goods requesting entry into the USA. This bond is a guarantee that all required duties and fees will be paid, and that the entry is in accordance with all laws and regulations of the USA.

Nuclear materials are "unequivocally duty free" until they are assembled into a completed fuel rod with the end caps attached. Since Customs generally accepts that nuclear material is duty free, it has allowed a minimum bond to be posted against the material's high value. Normally a bond of $100,000 for material, and $10,000 for shipping packages is acceptable at all ports of entry. A bond can be posted for a client by the customs house broker, or the client may post his own bond. However, it is most cost-effective to purchase a bond from a customs house broker, due to the broker's relatively small administrative fees.

To meet the variety of imports, several types of bonds are available.

A **general term bond** allows multiple entries into all US ports for one year. The general term bond may be purchased from a customs broker, at an approximate fee of $200 per year.

A **single entry bond** is used for a single entry of goods for consumption in the USA. This bond also may be purchased from a customs broker, at an approximate fee of $20-$50 per entry.

A **temporary import bond** allows material to remain in the country for one year prior to re-export, but extensions may be requested for up to five years. The fee charged by the broker for this bond is usually in the same range as the single entry bond: $20-$50 per import.

An **instrument of international trade bond** (IITB) is used for packages and containers that carry materials in international commerce. This includes cylinders, overpacks, or other containers and casks used for radioactive cargos. The IITB assures that the shipping packages are only entering the USA to carry goods to their destination and will not be used in US commerce. The IITB insures that a duty will be paid on the value of the packages should they be used in US commerce. The broker's fee is approximately $200 per year for the IITB.

DOCUMENTATION

Invoices

Invoices should be addressed to the named importer on the import license. But, often the receiving facility is named on the invoice, and, when the recipient does not match the import licensee, it can cause problems with customs inspections. This discrepancy can be remedied by showing both the importer and receiving facility on the invoice, and delineating the function of each.

Invoices for customs officials should be marked "For Customs Purposes Only", as they need not be commercial invoices. The Customs invoice for the shipping container should indicate the container's depreciated value. The invoice for the nuclear material should show the quantity and value of the material, as well as a unit cost to explain that value. If the material is being imported against an international import certificate (see Certification and Declaration section), the value on the invoice should be the same as that shown on the international import certificate.

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Because shipping packages are evaluated by Customs separately from the material, it is important to assure that separate *pro forma* customs invoices are issued and received for the packages and the material. Thus, the packages can be assigned a different bond from the material contained in the packages. However, such separate invoices are not necessary for uranium ore concentrate and its drums. Since Customs considers the drums to be disposable packaging, which will neither be consumed in the USA nor reused, the drums are not charged any import fees.

Bills of Lading

For an international export shipment, a **domestic inland bill of lading** is completed for the cargo's transit to the port. An **ocean bill of lading** is issued by the steamship carrier for the ocean voyage. In all cases, the basic description of the cargo and specifics as to the radioactive nature of the cargo must be included on each bill of lading.

Certificates and Declarations

The receiving/shipping facility in the USA must be advised of the appropriate specific import or export license number so that the facility can complete a **nuclear material transaction report** (NRC Form 741).

Each export must be accompanied by two copies of a **shipper's export declaration** (DOC Form 7525-V) that contains extensive shipment information. This form must be signed by the exporter or his agent and is required to be filed with Customs with the shipping manifest. It is a document under the control of the International Trade Administration (ITA), a department of the Bureau of the Census under the Department of Commerce (DOC). Because the document provides so much information, it is used for a myriad of purposes, from checking the legality of the shipment, to checking the US balance of trade for the month. A shipper's export declaration is not necessarily needed for empty shipping packages, but it is the document most often used as proof of export for other contractual and bonding purposes.

An **international import certificate** (DOC Form BXA-645P) is issued by the receiving country to verify that the country has knowledge of the pending shipment and that it has indicated the acceptability of the shipment to its government. The issuance of an international import certificate is not required by the USA for import into this country, but a French export license requires that the USA issue an international import certificate.

When it is necessary for the exporter to receive an international import certificate, the completed certificate application is sent to the Export Administration of the Department of Commerce. If the agency approves the application, it assigns and logs a certificate number, and then returns the approved certificate to the exporter.

A **delivery verification certificate** is presented to Customs at the time of import, so that the department will note on the certificate the entry information and provide the authorizing signature. The information on the delivery verification certificate (ITA Form 647P) should match the information on the international import certificate. Then the delivery verification certificate is forwarded to the customs house broker, who notes the exact quantity, the entry number, and the date, and returns it to Customs. The completed form is then sent to the appropriate exporting party for completion of documentation against the export license.

In the event that material is to be exported for foreign processing and then subsequently to re-enter the USA (for US consumption), it is useful to complete a **certificate of registration** (Customs Form 4455) and a **certificate of manufacture**. These documents can be used to prove the US origin of the returned goods and the fact that they were exported solely for processing. The re-imported goods are exempt from the customs user fee; however, this fee *is* applied to the added value of the foreign processing. When paying the customs user fee only on the value of the foreign processing, a **declaration for free entry of returned American products** (Customs Form 3311) is required.

When a Customs application is submitted for entry of foreign material to be processed in the USA and then re-exported, Customs may require the importer to supply a certificate of manufacture to avoid paying the customs user fee. In this case, the certificate of manufacture is completed by the US firm performing the processing of material, to confirm the material is only for foreign use.

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Air Shipment

An **air waybill** is issued by the air carrier, in accordance with the information in the shipper's letter of instruction for dispatch of goods or the shipper's declaration for dangerous goods. The air waybill must be completed and signed by the shipper, thus relieving the air carrier of the responsibility for goods improperly described on the carrier's manifest.

A copy of the US Department of Transportation's **certificate of competent authority** is required for air shipments of nuclear materials. It certifies that the shipping package design meets the regulatory requirements for Type B packaging for fissile radioactive materials as prescribed by the IAEA and by US regulations.

In addition to the normal requirements for markings and labels, a label for the cargo aircraft may also be required. Regulations covering the conditions for such a label are found in the International Civil Aviation document *Technical Instructions for the Safe Transport of Dangerous Goods by Air.*

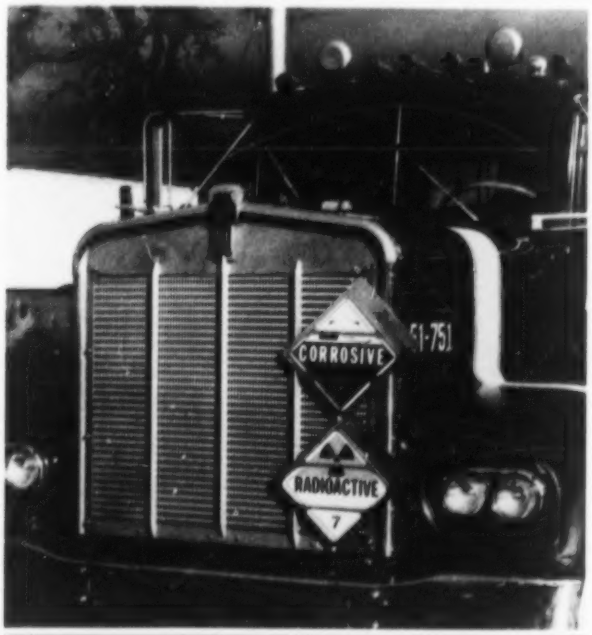

Figure 2 — DOT Required Markings. On the grill of this truck are two labels DOT requires for UF_6 transport.

HAZARDOUS MATERIALS REGULATIONS

The Department of Transportation (DOT) has issued regulations for the transport of hazardous materials, which include radioactive materials. Each type of material has an assigned proper shipping name and identification (ID) number (found in 49 *CFR* Part 172.101, subpart B). The most common ID numbers and proper shipping names used for the transport of commercial nuclear fuel are:

ID Number	Proper Shipping Name
• UN 2908	Radioactive material, empty packages
• UN 2910	Radioactive material, limited quantity, n.o.s.
• UN 2912	Radioactive material, LSA, n.o.s.
• UN 2918	Radioactive material, fissile, n.o.s.
• UN 2977	Uranium hexafluoride, fissile (> 1.0 w/o ^{235}U)
• UN 2978	Uranium hexafluoride, LSA

n.o.s. = no other specification (is more specific)
LSA = low specific activity

DOT regulations (49 *CFR* Part 172.200-204, Part C) require extensive information to appear in a specific order on shipping papers when hazardous materials are transported. Among the items that must be listed are: proper shipping name; identification number; name of the radionuclide (listed in 49 *CFR* Part 173.435); the physical and chemical form of the material; the curies of emitted radiation per package; the fissile class; total quantity of material by weight or volume; and the number and type of shipping packages. For enriched UF_6, the certificate of compliance for radioactive materials packages identification number (NRC Form 618, item 1c) must be included.

Shipping package markings are usually the responsibility of the package manufacturer or the originating facility of the shipment. However, the marking function can be assigned to a transport agent or carrier, and therefore knowledge of the marking requirements (49 *CFR* Part 172, subpart D) is important. A knowledge of labeling requirements (49 *CFR* Part 172, subpart E), and placarding requirements (49 *CFR* Part 172.500, subpart F) also is important. Markings/labels/placards on the shipping packages must match those on the shipping papers.

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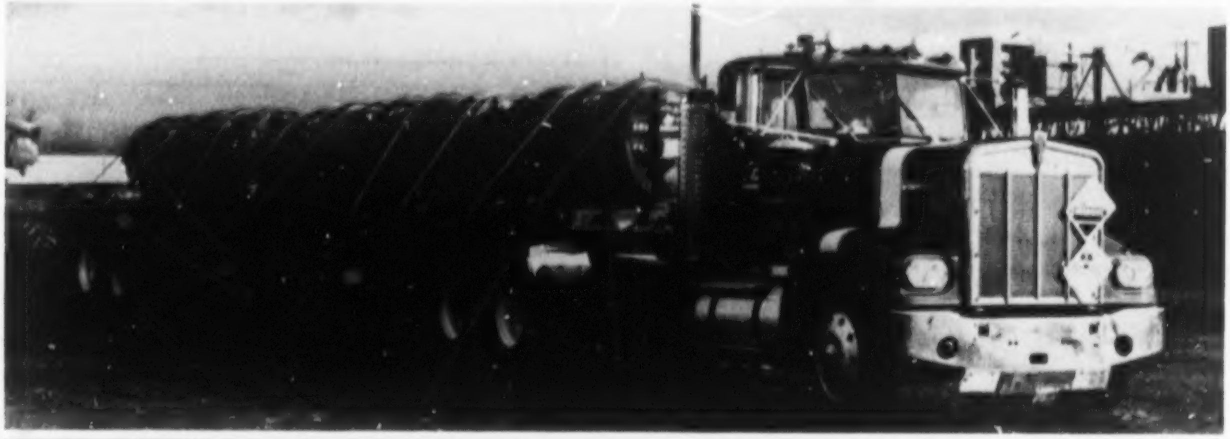

Figure 3 — Ready For Road Transport. Truck and trailer, with all DOT required labels, ready to move five UF6 containers.

The basics of the marking requirements are:

- The shipping package must have the gross weight, shipping package type, and certificate number legibly marked in 0.5-inch letters/numbers.
- The identification number must be displayed on an orange panel (6.25 inches high and 15.75 inches wide with a 0.56-inch black border).
- The identification number must *not* be displayed on a radioactive placard.

The basics of the labeling requirements are:

- A label on each individual shipping package is not required for low specific activity material when the material is being transported in a conveyance exclusively assigned for the use of the consignor.
- Each shipping package that requires a label for a hazard must have two of the proper labels, one of each attached to opposite sides of the shipping package.
- The proper label (49 *CFR* Part 172.403) is determined by the radiation level at the surface of the shipping package; the transport index; and (if appropriate) the fissile characteristics of the shipping package.
- If the material qualifies as having more than one hazard, the shipping package must be labelled for all hazards. An example is UF6 which is both a radioactive hazard and a corrosive hazard, and in Europe is also classed as a poison because of the fluorine content.

Since DOT regulations for transport are quite extensive, no attempt has been made to give a complete explanation in this article. Some of the more important of these regulations are as follows:

- Part 173 – Shipper's General Requirement for Shipments and Packaging. This part of the regulations includes specifications for material that is highway-route controlled, packaging requirements for radioactive materials, and requirements for exporting DOT specification Type B and fissile shipping packages.
- Part 174 – Carriage by Rail
- Part 175 – Carriage by Aircraft
- Part 176 – Carriage by Vessel
- Part 177 – Carriage over Public Highways
- Part 178 – Shipping Container Specifications. This part prescribes the manufacturing and testing for shipping packages and containers for hazardous materials.
- Part 397 – Driving and Parking Rules.

CONCLUSION

As with most government regulations, the entire array of relevant laws would fill the average library and probably is of interest only to the dedicated transport professional. This two-part article was intended to aid and familiarize those who depend on the transportation of nuclear fuels in their business dealings, yet rarely deal directly with transportation's complexities, the depth of regulations, logistics, packaging requirements, and transport modes involved.

Jeffrey D. Price
Alan L. Wolcott

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DEFINITIONS RELEVANT TO TRANSPORT REGULATIONS

Special Nuclear Materials – Under the *CFR* definitions, special nuclear materials include plutonium, uranium-233, or uranium enriched above 0.711 percent in the isotope uranium-235.

Source Materials – Source material, as defined in the *CFR*, is uranium (such as U_3O_8, and UF_6 at natural enrichment levels), thorium, or ores that contain, by weight, 0.05 percent or more of uranium or thorium, or any combination.

Person – Under the *CFR* definitions, is defined as any individual, corporation, partnership, firm, association, trust, estate, institution, or government agency, except the NRC (other government agencies may be exceptions under certain conditions).

Packaging – The *CFR* defines packaging as one or more receptacles and wrappers and their contents, excluding special nuclear materials, source material, or byproduct material, but including absorbent material, spacing structures, thermal insulation, radiation shielding, devices for cooling, devices for absorbing mechanical shock, external fittings, neutron absorbers, and other supplementary equipment.

A_1 and A_2 – These are points of reference for radionuclide quantity limitations.

The A_1 value is the number of curies for a particular radionuclide when the material, if released, might present a radiation hazard, but not a contamination hazard. These materials are usually encapsulated, such as cobalt.

The A_2 value is the number of curies for a particular radionuclide when the material is U_3O_8, UF_6, or enriched UF_6. The A_2 value is established according to the hazard that would result if an individual ingested or absorbed that radionuclide through his skin.

Transport Index – This is the highest dose rate at one meter distance from the external surface of the shipping package. The transport index can be assigned according to the radiation reading or may be determined by the assigned transport index on the shipping package certificate. Regulations prescribe that the maximum dose rate for transport shall not exceed 200 millirem per hour at any point on the surface of the shipping package, and that the transport index per package may not exceed 10.

Exclusive Use – An exclusive use shipment precludes any other cargo being shipped with the radioactive material. Often there is a surcharge for an exclusive use designation of a shipment, because, theoretically, a carrier is able to fill his vehicle to the maximum load limit, and exclusive use may leave unused capacity in the carrier's equipment.

Type A Shipping Packages – This designates a shipping package type which, during normal conditions of transport, will prevent the loss or dispersal of its contents and will maintain radiation shielding.

Type B Shipping Packages – This designates a shipping package type which will meet all Type A criteria, both during normal and accident conditions of transport.

Fissile Shipping Packages – This designates a shipping package type which must prevent nuclear criticality (unplanned nuclear chain reaction) under both normal and hypothetical accident test conditions.

Fissile shipping packages are, in turn, classified into one of three groups, according to the degree of control which must be exercised to assure nuclear criticality safety.

- **Fissile Class I** – Any number of packages may be transported together.
- **Fissile Class II** – The maximum transport index for all packages must not exceed 50, and no single package may have a transport index that exceeds 10.
- **Fissile Class III** – These packages must be controlled by specific arrangements between the shipper and the carrier. (Refer to Title 49 *CFR*, Part 173.457[*b*].)

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BASIC CONSIDERATIONS

SOURCES OF REGULATIONS

United States

US Department of Transportation
— Title 49, *Code of Federal Regulations*, Parts 100-199

US Nuclear Regulatory Commission
— Title 10, *Code of Federal Regulations*, Parts 71-110

US Postal Service
— Title 39, *Code of Federal Regulations*, Parts 124

US State and Local Transportation Regulations & Legislations
— this is a database compiled and updated quarterly by the Department of Energy, Chicago Operations.

International

International Atomic Energy Agency (IAEA)
— *Regulations for the Safe Transportation of Radioactive Materials – Safety Series 6*
Available from UNIPUB, 1180 Avenue of the Americas, New York, New York 10038 USA

International Civil Aviation Organization (ICAO)
— *Technical Instructions for the Safe Transport of Dangerous Goods by Air*
Available from INTEREG, PO Box 60105, Chicago, Illinois 60660 USA

International Air Transport Association (IATA)
— *Restricted Articles Regulations*
Available from IATA, 200 Peel Street, Montreal, Quebec, Canada H3A 2R4

International Maritime Organization (IMO)
— *International Maritime Dangerous Goods Code (IDMG)*
Based in London, England, and available from numerous steamship lines.

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NUCLEAR INDUSTRY CALENDAR

1992

Sept. 9-11 *Uranium Institute 17th Annual Symposium* (London, United Kingdom).
Contact: 44-71-225-0303; Fax: 44-71-225-0308.

Sept. 20-23 *International Uranium Seminar '92* (Hyatt Regency Hotel, Lake Tahoe, Nevada).
Sponsored by the U.S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

Sept. 21-23 *2nd International Conference on Training for Operation & Maintenance in the Nuclear Industry*
(The Moat House International Hotel, Stratford-upon-Avon, United Kingdom).
Sponsored by the Institution of Nuclear Engineers.
Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.

Sept. 29-Oct. 1 *Crisis/Emergency Information Planners' Workshop* (Loews L'Enfant Plaza, Washington DC)
Sponsored by the U.S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

Oct. 18-22 *AMC Mining Convention* (Las Vegas, Nevada)
Sponsored by the American Mining Congress.
Contact: AMC Convention Office; 202-861-2800; Fax: 202-861-7535.

Oct. 19-23 *International Symposium on Geological Disposal of Spent Fuel, High-level and Alpha-bearing Wastes*
(Antwerp, Belgium).
Sponsored by the International Atomic Energy Agency.
Contact: IAEA, P. O. Box 100, A-1400 Vienna, Austria.

Nov. 15-18 *International Nuclear Energy Forum* (Fairmont Hotel, Chicago, Illinois).
Sponsored by the U.S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

Nov. 15-20 *American Nuclear Society Winter Meeting* (McCormick Center Hotel, Chicago, Illinois).
Contact: ANS Meetings Department; 708-352-6611.

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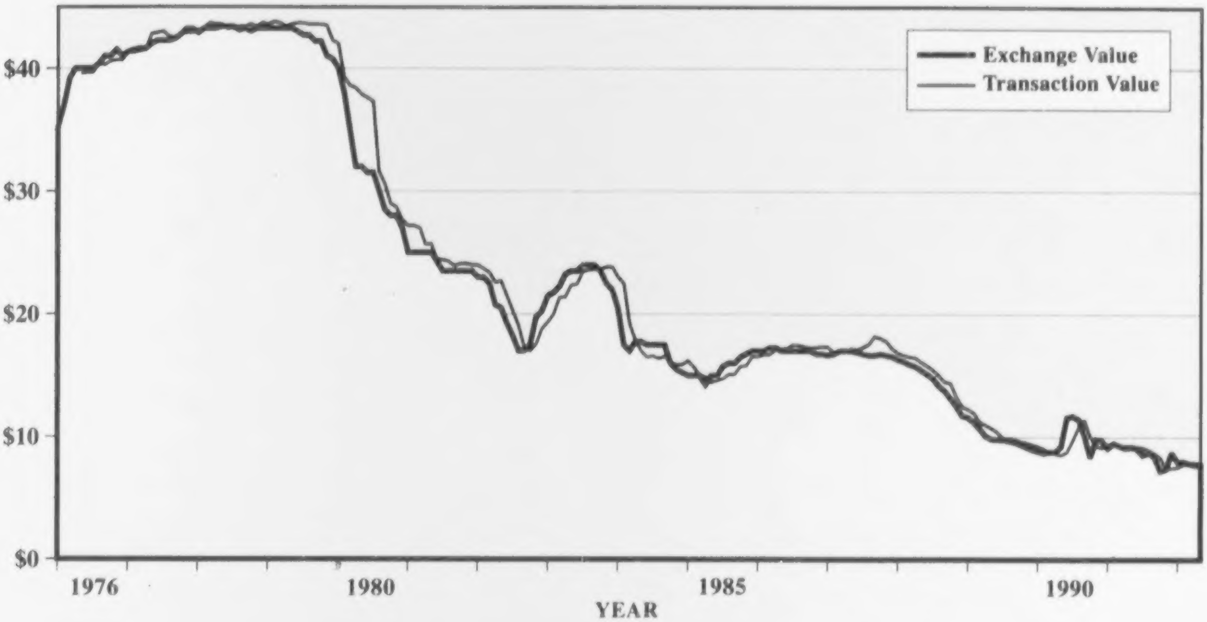
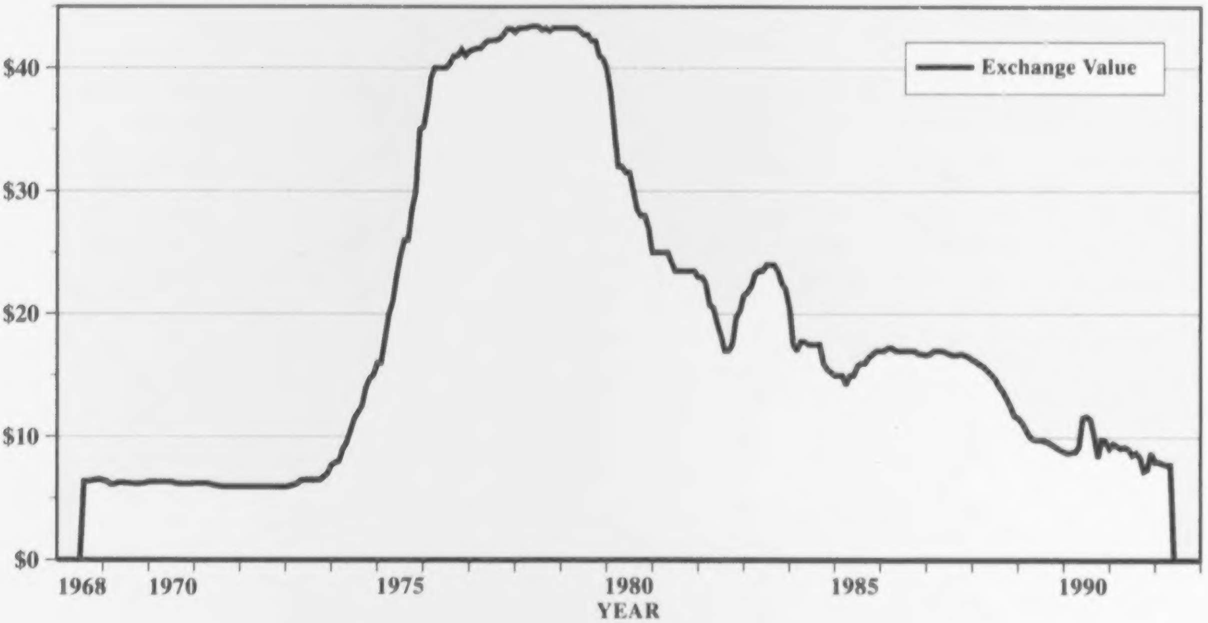
NUEXCO HISTORICAL EXCHANGE VALUE AND TRANSACTION VALUE

(in US dollars per pound U_3O_8)





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HISTORICAL MARKET VALUES

Exchange Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	9.80	9.70
1991	9.10	9.50	9.30	9.10	9.20	9.05	8.55	8.75	8.40	7.25	7.40	8.75
1992	8.00	8.00	7.85	7.75	7.75	**7.75**						

US Premium (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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UF₆ Values

Determined as of the last day of the month indicated ($US/kg U as UF₆)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29.50	24.75	28.75	28.75
1991	27.50	27.75	27.50	27.25	27.60	27.25	25.75	26.25	25.50	22.75	22.75	26.00
1992	24.50	24.25	24.00	23.75	23.60	**23.60**						

US Premium (Relative to the UF₆ Value)

Determined as of the last day of the month indicated ($US/kg U as UF₆)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

Conversion Values

Determined as of the last day of the month indicated ($US/lb U as UF₆)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
1991	1.45	1.45	1.45	1.45	1.50	1.50	1.50	1.60	1.55	1.55	1.55	1.55
1992	1.60	1.60	1.60	1.60	1.60	**1.50**						

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Transaction Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	9.30	9.15
1991	9.40	9.45	9.35	9.30	9.30	9.20	9.15	8.95	8.70	8.35	7.45	7.50
1992	7.55	7.80	7.95	7.90	7.85	**7.80**						

SWU Values

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	51	51
1991	51	50	52	52	54	59	66	67	67	68	68	70
1992	71	70	69	67	65	**65**						

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Loan Rates

	Determined as of the last day of the month indicated (Percent per Annum)											
Year	**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1991	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.00
1992	3.00	3.00	3.00	3.00	3.00	**3.00**						

* Float with Prime Rate

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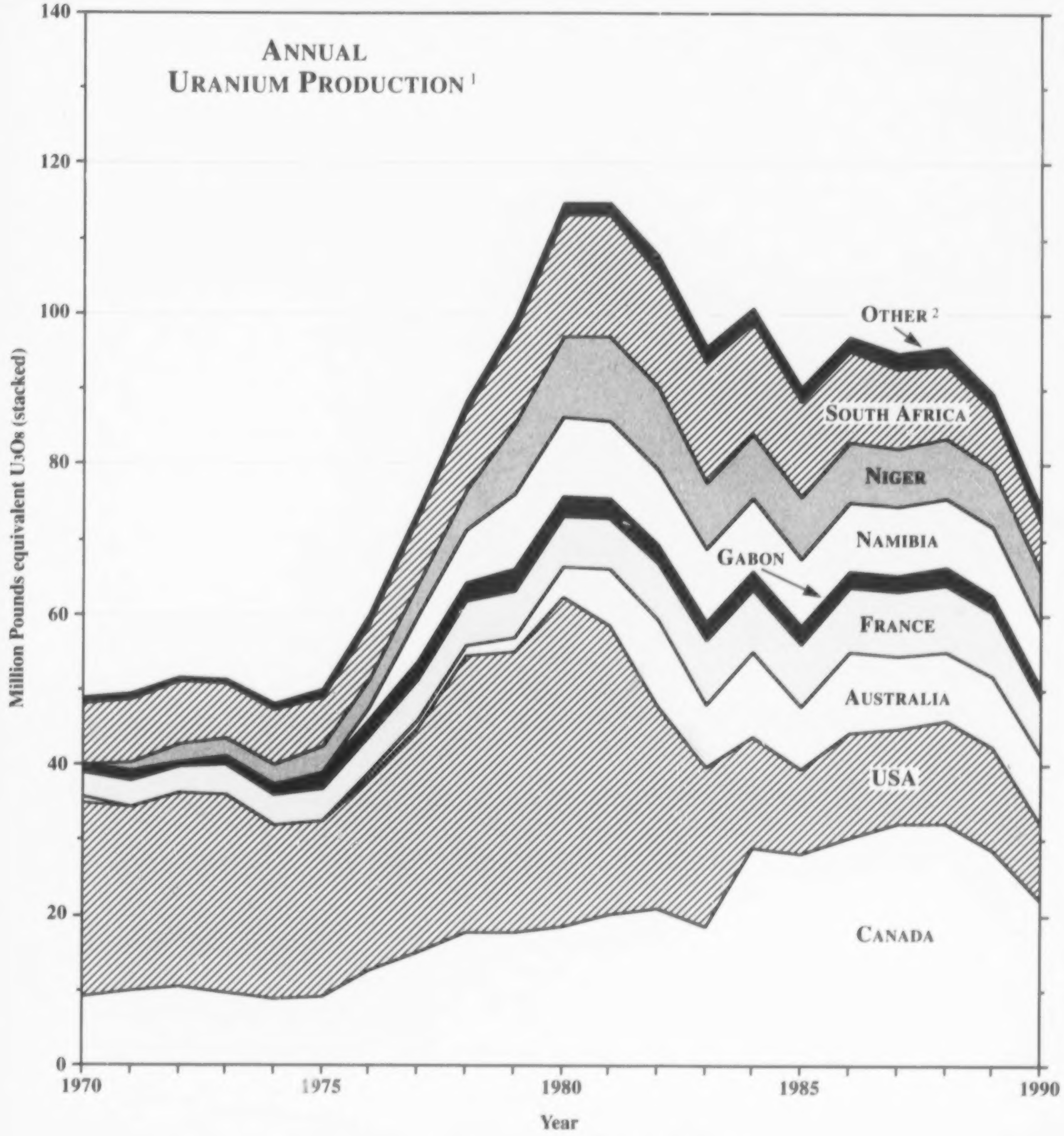

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[1] Estimated western world uranium production in 1990 totalled 74.5 million pounds equivalent U_3O_8 — (Australia: 9.1 – Canada: 22.0 – France: 7.4 – Gabon: 1.8 – Namibia: 8.0 – Niger: 7.4 – South Africa: 6.4 – USA: 10.2 – Other[2]: 2.2)

[2] **Other** includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, former West Germany, and Yugoslavia (Slovenia)

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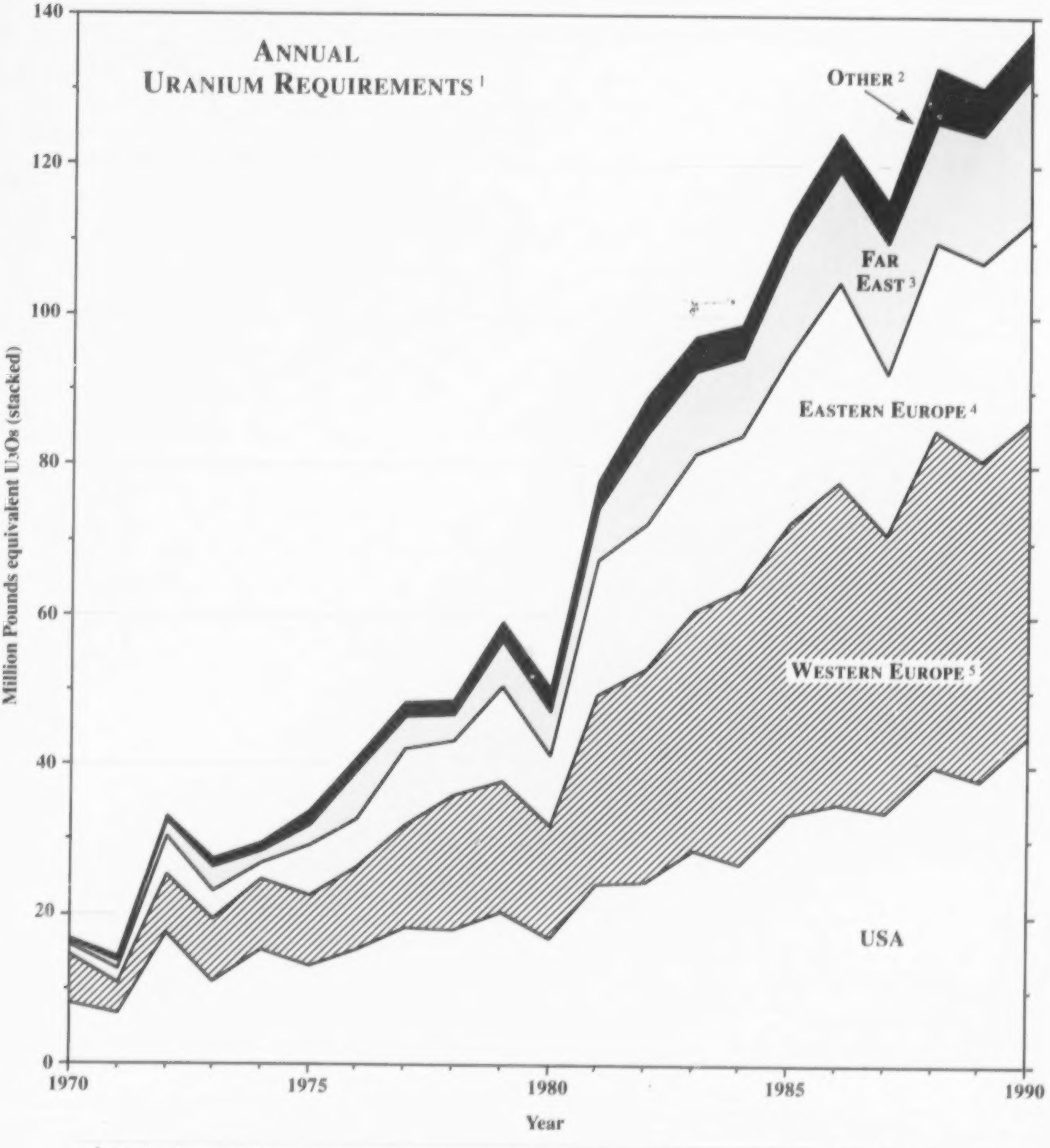
HISTORICAL MARKET DATA



[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assay.

[2] **Other** includes: Argentina, Brazil, Canada, India, Mexico, Pakistan, and South Africa.

[3] **Far East** includes: Japan, People's Republic of China, South Korea, and Taiwan.

[4] **Eastern Europe** includes: Bulgaria, Czechoslovakia, former East Germany, Finland, Hungary, former Soviet Union, and Yugoslavia (Slovenia).

[5] **Western Europe** includes: Belgium, France, former West Germany, Italy, The Netherlands, Spain, Sweden, Switzerland, and UK.

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Australia

Year	Period[1]	Consumer Price Index[2] (1989/1990 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia[4] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[5] (June 1985 = 100)
1980	Avg.	47.4	83.1	—	69.6
1981	Avg.	51.9	85.9	—	76.1
1982	Avg.	57.7	89.0	—	86.4
1983	Avg.	56.9	96.9	—	89.9
1984	Avg.	66.0	98.0	—	96.0
1985	Avg.	70.5	107.3	—	100.0
1986	Avg.	76.9	101.5	—	104.9
1987	Avg.	83.4	108.9	465.88	112.9
1988	Avg.	89.4	111.8	496.90	115.4
1989	Avg.	96.2	117.0	534.65	126.0
1990	Avg.	103.2	123.4	571.43	129.7
1991	Avg.	106.5	120.1	600.35	133.7**R**
Jan	1991	—	125.6	—	133.0
Feb	1991	—	121.5	597.70	133.0
Mar	1991	105.8	119.1	—	133.3
Apr	1991	—	117.6	—	133.3**R**
May	1991	—	117.8	592.00	133.4**R**
June	1991	106.0	120.4	—	133.4**R**
July	1991	—	120.4	—	133.4**R**
Aug	1991	—	119.9	599.50	133.8**R**
Sept	1991	106.6	118.3	—	134.2
Oct	1991	—	118.7	—	134.3**R**
Nov	1991	—	120.6	612.20	134.4
Dec	1991	107.6	121.2	—	134.5**R**
Jan	1992	—	120.9	—	134.7**R**
Feb	1992	—	120.9	625.20	134.7
Mar	1992	107.6	120.0	—	134.8
Apr	1992	—	120.5	—	134.8

P = Preliminary   **R** = Revised since last month

[1] Monthly data for the period 1967 to 1990 appears in NUEXCO Monthly Report 278.

[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1989 to June 1990 = 100.0). Figures shown at end of quarter represent quarterly average. Base year changed from 1980/81 in Monthly Report 286.

[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (CATALOGUE No. 6411.0).

[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (CATALOGUE No. 6312.0). Figures for the latest fourteen months shown are subject to revision.

[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (CATALOGUE No. 6302.0).

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Canada

Year	Period	Industrial Products Price Index: All Commodities[1] (1986 = 100)[2]	Consumer Price Index: All Items (1986 = 100)[3]	Wage-earner Data: Average Hourly Earnings (C$)[4] Uranium Mines (SIC 057)	Metal Mines (SIC 061)	Mines, Quarries and Oil Wells (SIC 061-092)	Metal Rolling, Casting and Extruding (SIC 299)	Chemicals and Chemical Products Industries (SIC 371-379)
1980	Avg.	75.9	67.2	—.—	—.—	—.—	—.—	—.—
1981	Avg.	83.6	75.5	—.—	—.—	—.—	—.—	—.—
1982	Avg.	89.0	83.7	—.—	—.—	—.—	—.—	—.—
1983	Avg.	92.1	88.5	17.22	14.98 **R**	14.58 **R**	10.17 **R**	11.03 **R**
1984	Avg.	96.3	92.4	17.89	15.92 **R**	15.29 **R**	10.59 **R**	11.67 **R**
1985	Avg.	99.0	96.0	18.53	16.35 **R**	15.83 **R**	11.54 **R**	12.14 **R**
1986	Avg.	100.0	100.0	19.38	16.67 **R**	15.98 **R**	12.20 **R**	12.65 **R**
1987	Avg.	102.8	104.4	20.12	16.90 **R**	16.25 **R**	13.04 **R**	13.22 **R**
1988	Avg.	107.2	108.6	20.91	18.14 **R**	17.22 **R**	13.58 **R**	13.72 **R**
1989	Avg.	109.4	114.0	21.97	19.05 **R**	18.37 **R**	14.02 **R**	14.31 **R**
1990	Avg.	109.7	119.4	22.90	19.94 **R**	19.11 **R**	14.88 **R**	15.13 **R**
1991	Avg.	108.6 **R**	126.2	24.35	21.45 **R**	20.59 **R**	14.94 **R**	16.22 **R**
Jan	1991	111.1	125.0	23.79	20.86 **R**	19.94 **R**	14.86 **R**	15.51 **R**
Feb	1991	110.6	125.0	25.23	21.39 **R**	20.39 **R**	14.82 **R**	15.84 **R**
Mar	1991	109.8	125.5	24.19	21.26 **R**	20.57 **R**	15.50 **R**	16.19 **R**
Apr	1991	109.1	125.5	24.77	21.22 **R**	20.57 **R**	14.76 **R**	16.28 **R**
May	1991	108.6	126.1	24.38	21.01 **R**	20.51 **R**	15.04 **R**	16.26 **R**
June	1991	108.5	126.7	23.58	20.96 **R**	20.10 **R**	14.67 **R**	16.25 **R**
July	1991	108.2	126.8	24.70	21.22 **R**	20.17 **R**	14.52 **R**	16.07 **R**
Aug	1991	107.8	126.9	23.78	22.56 **R**	20.96 **R**	14.72 **R**	16.01 **R**
Sept	1991	107.6	126.7	24.23	21.44 **R**	20.61 **R**	14.95 **R**	16.40 **R**
Oct	1991	107.3	126.5	24.40	21.68 **R**	20.80 **R**	15.13 **R**	16.43 **R**
Nov	1991	107.3 **R**	127.0	24.58	21.83 **R**	21.05 **R**	15.00 **R**	16.46 **R**
Dec	1991	107.2 **R**	126.4	24.53	21.99 **R**	21.39 **R**	15.30 **R**	16.92 **R**
Jan	1992	107.2	127.0	24.79	22.01 **R**	21.48 **R**	15.78 **R**	16.91 **R**
Feb	1992	108.0	127.1	24.42	21.87 **R**	21.41 **R**	16.18 **R**	16.82 **R**
Mar	1992	108.2	127.5	24.92	21.97 **R**	21.37 **R**	16.31 **R**	16.62 **R**
Apr	1992	108.0 **R**	127.6	**[5]	22.13 **P**	21.95 **P**	16.53 **P**	16.52 **P**
May	1992	108.5	127.8	**	—.—	—.—	—.—	—.—

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (CATALOGUE 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1990 is found in NUEXCO Monthly Report 278.

[2] New Base Year of 1986 as of NUEXCO Monthly Report 266. Previous Base Year was 1981.

[3] New Base Year of 1986 as of NUEXCO Monthly Report 264. Previous Base Year was 1981.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1990 is found in NUEXCO Monthly Report 278. SIC number revisions shown starting in Monthly Report 287.

[5] As of April 1992, Statistics Canada no longer provides specific information on uranium mine wages. The data has been included with Metal Mines (SIC 061).

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South Africa

Year	Period	Average Declared Working Costs per Metric Ton of Gold Ore Milled[1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled[2] (March 1982 = 100)	Consumer Price Index[3] (1990 = 100)	Production Price Index All Groups[4] (1990 = 100)	Total Employment in Mining and Quarrying[5]	Total Salaries and Wages in Mining and Quarrying[5] (1,000 Rand)
							Annual Total[6]
1980	Avg.	35.50	—	25.5	27.7	709,042	2,237,689
1981	Avg.	41.87	—	29.4	31.5	722,918	2,756,928
1982	Avg.	47.23	103.9	33.7	35.9	702,041	3,181,584
1983	Avg.	51.88	115.0	37.8	39.7	700,901	3,563,282
1984	Avg.	58.95	130.3	42.2	43.0	711,511	4,134,390
1985	Avg.	68.70	151.7	49.1	50.3	724,587	4,778,612
1986	Avg.	80.18	177.9	58.2	60.1	756,637	5,767,950
1987	Avg.	95.01	223.1	67.6	68.5	751,864	6,911,395
1988	Avg.	106.69	241.1	76.2	77.5	705,355	7,774,054
1989	Avg.	116.65	273.0	87.4	89.3	700,360	8,833,934
1990	Avg.	129.37	305.3	100.0	100.0	677,742	10,193,209
1991	Avg.	136.06	322.4	115.1 **R**	111.4	630,722	10,934,073
							Monthly Total
Jan	1991	—	—	107.7	108.6	648,944	935,839
Feb	1991	—	—	109.0	109.0	650,948	893,373
Mar	1991	137.66	323.82	110.0	108.2	651,843	924,930
Apr	1991	—	—	111.5	108.8	639,939	887,722
May	1991	—	—	113.2	109.8	630,481	887,107
June	1991	134.65	317.23	114.0	110.3	640,908	890,595
July	1991	—	—	115.5	111.2	637,581	881,182
Aug	1991	—	—	117.1	112.0	633,699	963,710
Sept	1991	137.11	329.05	118.7	113.2	639,535	1,014,424
Oct	1991	—	—	119.8	114.8	584,435	860,529
Nov	1991	—	—	120.9	115.3	602,461	853,864
Dec	1991	134.81	319.33	123.8 **R**	115.8	602,486	940,798
Jan	1992	—	—	125.1	115.9	—	—
Feb	1992	—	—	126.2	116.3	—	—
Mar	1992	139.69	331.46	127.3	116.9	—	—
Apr	1992	—	—	128.9	118.4	—	—
May	1992	—	—	129.9	—	—	—

P = Preliminary **R** = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in NUEXCO Monthly Report 278.

[2] Page 16 of Report 178 contains description and calculation of index.

[3] Central Statistical Service, Pretoria: All income groups-weighted average, Historical Data by month appears in NUEXCO Monthly Report 278.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa. Base Year changed from 1985 to 1990 in NUEXCO Monthly Report 284.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in NUEXCO Monthly Report 236.

[6] Annual total is shown, rather than monthly average, for indicated year.

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United States

Year	Period	Producer Price Index[1]		Consumer Price Index[2] (1982-1984 = 100)	GNP Implicit Price Deflator[3] (1987 = 100)	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
		Industrial Commodities (1982 = 100)	All Commodities (1982 = 100)			Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
1980	Avg.	88.0	89.8	82.4	71.7	10.26	10.63	8.31	6.94
1981	Avg.	97.4	98.0	90.9	78.9	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	83.8	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	87.2	12.58	13.43	10.58	8.66
1984	Avg.	103.3	103.7	103.9	91.0	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	94.4	13.38	13.74	11.57	9.46
1986	Avg.	100.0	100.2	109.6	96.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	100.0	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	103.9	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	108.4	13.59	13.72	13.09	10.05
1990	Avg.	115.8	116.3	130.7	112.9	14.10	14.36	13.54	10.32
1991	Avg.	116.5	116.5	136.2	117.0	14.89	14.64	14.07	10.73
Jan	1991	119.3	119.0	134.6	—	14.73	14.63	13.85	10.60
Feb	1991	117.2	117.2	134.8	—	14.80	14.55	13.81	10.59
Mar	1991	115.6	116.1	135.0	115.9	14.93	14.55	13.85	10.55
Apr	1991	115.6	116.0	135.2	—	14.85	14.56	13.96	10.63
May	1991	116.1	116.5	135.6	—	14.79	14.52	14.01	10.66
June	1991	116.1	116.4	136.0	116.8	14.88	14.51	14.05	10.74
July	1991	116.0	116.1	136.2	—	15.09	14.56	14.16	10.77
Aug	1991	116.3	116.2	136.6	—	14.82	14.64	14.06	10.78
Sept	1991	116.3	116.1	137.2	117.4	15.04	14.59	14.21	10.84
Oct	1991	116.7	116.4	137.4	—	14.94	14.75	14.25	10.78
Nov	1991	116.7	116.4	137.8	—	15.29	14.89	14.27	10.88
Dec	1991	116.1	115.9	137.9	117.9	15.13	14.87	14.34	10.96
Jan	1992	115.7 **R**	115.6	138.1	—	15.06	14.74	14.30	10.90
Feb	1992	116.0	116.1	138.6	—	15.22	14.67	14.29	10.90
Mar	1992	115.9	116.1	139.3	118.8	15.05 **R**	14.57 **R**	14.26 **R**	10.92 **R**
Apr	1992	116.3	116.3	139.5	—	15.05 **P**	14.62 **P**	14.39 **R**	10.97 **R**
May	1992	117.2	117.1	139.7	—	—·—	—·—	14.42 **P**	10.97 **P**

P = Preliminary **R** = Revised since last month

[1] US Bureau of Labor Statistics, Washington, DC: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents Historical data is presented in NUEXCO Monthly Report 278.

[2] US Bureau of Labor Statistics, Washington, DC: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in NUEXCO Monthly Report 278.

[3] US Department of Commerce, Washington, DC: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted. Historical data is presented in Report 278. Base Year change from 1982 to 1987 in NUEXCO Monthly Report 284.

[4] US Bureau of Labor Statistics, Washington, DC: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in NUEXCO Monthly Report 278.

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Uranium Deliveries To The European Community[1]

— Compiled from data published by the Euratom Supply Agency —

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price in ECU per pound U_3O_8	Medium or Long-Term Contracts[3] Average Price in US Dollars per pound U_3O_8	Spot Contracts[3] Average Price in ECU per pound U_3O_8	Spot Contracts[3] Average Price in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19
1990	12,800	16.7	ECU 23.08	$29.39	ECU 7.60	$ 9.68

P = Preliminary **R** = Revised since last month

[1] The twelve European Community member nations are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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US Uranium Marketing Data

— Compiled from data published by the US Energy Information Administration[1] —

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers[2] (million pounds U_3O_8)	Average Price of Delivered Uranium[2] (\$/lb. U_3O_8)	Quantity of Uranium Imported[3] (million pounds U_3O_8)	Average Price of Imported Uranium (\$/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	$16.10	3.6	n/a	1.2
1977	29.9	27.8	$19.75	5.6	n/a	4.0
1978	37.0	31.6	$21.60	5.2	n/a	6.8
1979	37.5	33.0	$23.85	3.0	n/a	6.2
1980	43.7	35.0	$28.15	3.6	$43.10	5.8
1981	38.5	32.6	$34.65	6.6	$32.90	4.4
1982	26.9	23.5	$38.37	17.1	$25.19	6.2
1983	21.2	24.2	$38.21	8.2	$26.16	3.3
1984	14.9	22.5	$32.65	12.5	$21.86	2.2
1985	11.3	21.7	$31.43	11.7	$20.08	5.3
1986	13.5	18.9	$30.01	13.5	$20.07	1.6
1987	13.0	20.8	$27.37	15.1	$19.14	1.0
1988	13.1	17.6	$26.15	15.8	$19.03	3.3
1989	13.8	18.4	$19.56	13.1	$16.75	2.1
1990	8.9	20.5	$15.70	23.7	$12.55	2.0

P = Preliminary **R** = Revised since last month

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity.*
1984-1990: Energy Information Administration, *Uranium Industry Annual.*

[2] Data for 1976-1981 includes both domestic utilities and agents.

[3] Includes imports by domestic utilities and domestic suppliers.

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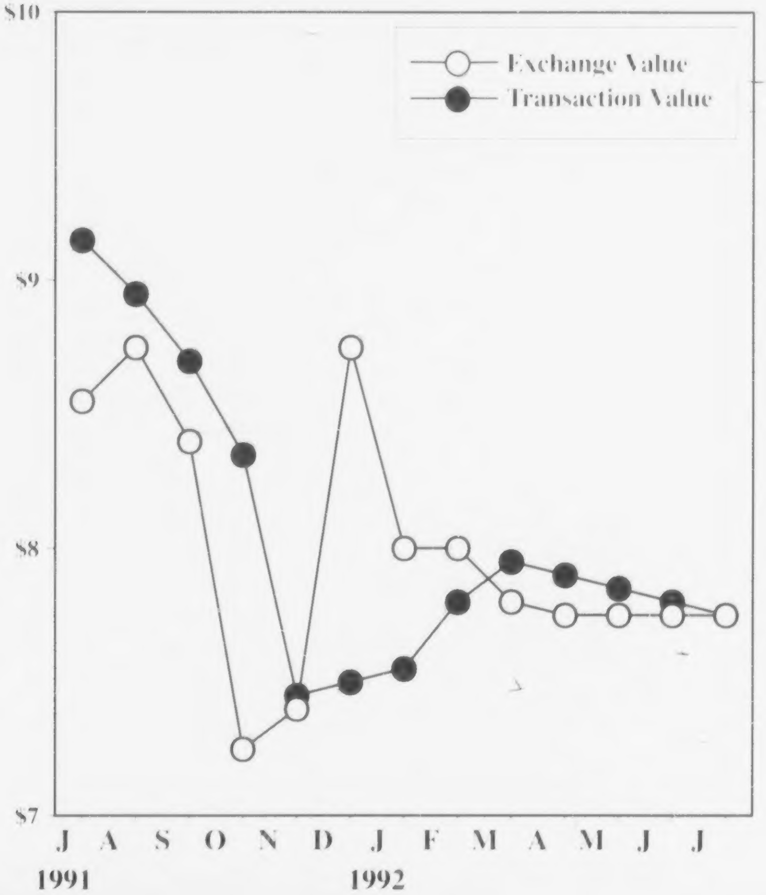

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The merger of Japan's two largest fuel cycle companies to form Japan Nuclear Fuels, Ltd. had long been anticipated and represents one of the most significant restructuring events in the country's nuclear industry. The formation of JNFL was a logical progression in the evolution of Japan's fuel cycle, bringing together complementary technologies and making an effort to improve community relations.

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- **Uranium Industry Update**

Tough times for the uranium industry continued during the first half of 1992, as prices remained depressed and numerous mine closures or shutdowns occurred. Nevertheless, some producers continue to survive by focusing on their most profitable operations, while others have become part of the many consolidations streamlining the industry.

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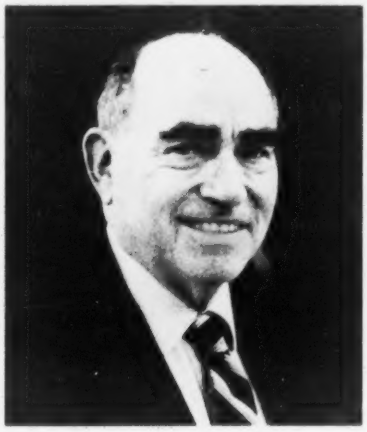
To Our Readers

CONCORD/NUEXCO is very pleased to announce that Dr. Bertram Wolfe has joined CONCORD's International Advisory Committee (IAC). Dr. Wolfe has been a vice-president of General Electric and General Manager of GE Nuclear Energy since 1987.

Dr. Wolfe received his B.A. in Physics from Princeton University in 1950 and his Ph. D. from Cornell University in 1954. He has worked at GE since 1955 in almost all phases of nuclear energy, including reactor design, fuel supply, waste management, and development of new reactor concepts. During the 1950s and 1960s, he led the nuclear core design effort on several new test and research reactors, including the Engineering Test Reactor, the GE Test Reactor, and the Radiation Effects Reactor. During 1969-71, he was Associate Director of Battelle Northwest Laboratories.



Dr. Wolfe returned to GE in 1971 and was given responsibility for GE's nuclear fuel supply and services business. He also was responsible for the GE advanced boiling water reactor program, which culminated in the advanced BWR now under construction at the Kashiwazaki-Kariwa site in Japan.

Dr. Wolfe is a member of the Board of Directors of the Nuclear Management & Resources Council, the US Council for Energy Awareness, the Nuclear Power Oversight Committee, and the American Nuclear Energy Council. He is a fellow and past president of the American Nuclear Society, a professional engineer in the state of California, and a member of the National Academy of Engineering and the Energy Engineering Board of the National Research Council. Dr. Wolfe holds a number of patents and is the author of over one hundred publications concerning nuclear energy, and energy in general. In June 1990, he received the Walter H. Zinn Award for outstanding contributions to nuclear power. CONCORD/NUEXCO is proud to welcome him to the IAC.

* * *

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MARKET REVIEW

Market Values Summary

NUEXCO Market Values	This Report July 31, 1992	Last Report June 30, 1992	12 Months Ago July 31, 1991
EXCHANGE VALUE [1]	**\$7.75** / lb equivalent U_3O_8	\$7.75	\$8.55
UF_6 VALUE [2]	**\$23.50** / kg U as UF_6	\$23.60	\$25.75
LOAN RATE [3]	**3.0%** / annum	3.0%	3.5%
CONVERSION VALUE [4]	**\$1.50** / lb U as UF_6	\$1.50	\$1.50
SWU VALUE [5] **(0.3 w/o tails assay)**	**\$66** / SWU	\$65	\$66
TRANSACTION VALUE [6]	**\$7.75** / lb equivalent U_3O_8	\$7.80	\$9.15
Transactions	**35**	26	21
Months	**3**	3	3
Millions of Pounds	**8.5**	6.0	4.1

DEFINITIONS

[1] The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

[2] The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

[3] The **Loan Rate** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

[4] The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

[5] The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

[6] The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

a) Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;

b) At least ten transactions;

c) Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US\$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.
- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.
- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight-percent (w/o) ^{235}U and a product assay of 3.0 weight-percent ^{235}U, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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JULY MARKET REVIEW

(as of July 31, 1992)

OVERVIEW

The uranium market remained very active in July, as a number of buyers entered the market and concluded transactions. Despite the high level of demand, supply was ample, and the July 31 Exchange Value remained unchanged at $7.75 per pound U_3O_8. In contrast, demand was lower in the UF_6 market, and the UF_6 Value declined $0.10, to $23.50 per kgU as UF_6, reflecting continued competition among sellers for the limited UF_6 demand.

Market activity was brisk during the month: fifteen near-term uranium transactions totalling 5.3 million pounds equivalent U_3O_8 were reported (**Table 1**). Eleven sales involved concentrates; two involved natural UF_6; and two, enriched uranium product (EUP). Year-to-date, near-term uranium sales volume now approaches 28 million pounds equivalent U_3O_8 in 82 transactions, slightly ahead of the record pace of 1990. In addition, two long-term concentrates transactions totalling 1.5 million pounds equivalent U_3O_8 were reported in July.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	July 1992		Year-to-Date	
	No. of Sales	Volume [1]	No. of Sales	Volume [1]
Concentrates	11	4.3	53	17.0
Natural UF_6	2	0.3	17	5.4
EUP	2	0.7	12	5.3
Total [2]	**15**	**5.3**	**82**	**27.7**

[1] Million pounds equivalent U_3O_8

[2] Due to independent rounding, columns may not equal total.

The Loan Rate remained unchanged at 3.0 percent per annum. Two natural UF_6 loans totalling more than 500 thousand pounds equivalent U_3O_8 were reported. The Conversion Value also was unchanged, remaining $1.50 per pound U as UF_6. No conversion transactions were reported.

The SWU Value increased by one dollar, to $66 per SWU, as sellers were less aggressive during July. Four enrichment transactions were reported, totalling more than 150 thousand SWU; two of the sales involved EUP.

NATURAL URANIUM AND CONVERSION

July witnessed a significant increase in market activity, as a number of buyers, many of them unexpected, entered the market. Despite the volume that cleared during the month, the July 31 **Exchange Value** remained unchanged at **$7.75** per pound U_3O_8, marking the fourth consecutive month at that level. However, prices in July were not stationary. A surge in supply led to increased sales competition, causing market levels to dip slightly in the middle of the month; but supply tightened gradually, and prices had firmed by month-end.

Eleven near-term concentrates sales were reported, totalling more than 4.3 million pounds equivalent U_3O_8. US utilities completed five purchases, accounting for the majority of the volume. Five producer purchases, plus a purchase of moderate quantity by an unidentified buyer, accounted for the balance. Most of the sales were made by intermediaries, in keeping with the norm of the past several months. Nearly all of the sales were concluded at price levels at or near the July 31 Exchange Value.

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The UF_6 market declined slightly in July, as demand remained weak. The **UF_6 Value** slipped $0.10, to **$23.50** per kgU as UF_6, in the face of strong competition among sellers to capture the limited UF_6 demand. UF_6 prices during most of July were fairly consistent, with most bids and offers staying within a narrow range around the previous UF_6 Value, before a modest decline in the latter part of the month. Reflecting the continued UF_6 supply/demand imbalance, uranium hexafluoride is now selling at a small discount compared to the sum of the values of its components.

Two natural UF_6 transactions were reported in July. An intermediary and a utility purchased a total exceeding 300 thousand pounds equivalent U_3O_8 from intermediaries; both near-term sales occurred at prices near the July 31 UF_6 Value.

* * *

In the **long-term uranium market**, two transactions were reported, totalling 1.5 million pounds equivalent U_3O_8. Utilities were the buyers in each case, purchasing concentrates from an intermediary and a producer for delivery during the period 1993 through 2000. One sale was concluded in June, the other during first quarter 1992.

Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply[1]	Active Demand[1]
• Uranium (thousand lbs equivalent U_3O_8)	7,030	885
• Supply/Demand Ratio:	7.9	
• Loan (thousand lbs equivalent U_3O_8)	5,250	1,250
• Conversion (thousand lbs U as UF_6)	2,660	620
• SWU (thousand SWUs)	935	5

[1] Supply and Demand tables in the Market Review section of this Report provide details for each category.

* * *

The **Transaction Value** declined $0.05 for the fourth consecutive month, to **$7.75** per pound U_3O_8. This is only the second time in the 16-year history of the Transaction Value that it has equalled the Exchange Value, further illustrating the recent stability of the uranium spot market. (April 30, 1987 was the first time they were equal). The July 31 Transaction Value was based on 35 transactions over three months involving 8.5 million pounds equivalent U_3O_8.

* * *

Active uranium supply climbed to **7.0 million** pounds equivalent U_3O_8, up about 800 thousand pounds from its June 30 level. **Active uranium demand** dropped to **885 thousand** pounds equivalent U_3O_8 at the end of July—a decline of 1.6 million pounds. The resultant **supply/demand ratio** is **7.9** (**Table 2**).

* * *

The **Loan Rate** remained unchanged at **3.0** percent per annum. Two natural UF_6 loans were reported, in which intermediaries borrowed a total of more than 500 thousand pounds equivalent U_3O_8 from utilities. Loan supply remains abundant, exceeding loan demand by four million pounds.

* * *

The **Conversion Value** was unchanged, remaining **$1.50** per pound U as UF_6. The secondary conversion market was quiet during July: no transactions were reported.

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ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

During the first half of the year, competition for the limited SWU demand was keen, leading to progressively lower prices. However, sellers were less aggressive in July, and the **SWU Value** edged up one dollar, to **$66** per SWU. The near-term enrichment market remains fairly thin: with few exceptions, spot sales throughout the year have involved only modest quantities of SWU.

Four near-term enrichment transactions were reported, in which two European and two US utilities purchased a total exceeding 150 thousand SWU. Two of the sales involved EUP and included almost 700 thousand pounds equivalent U_3O_8 of contained feed.

Table 3
ENRICHMENT PRICES
(July 31, 1992)

Prices	This Month Report 288	Last Month Report 287	12 Months Ago Report 276
NUEXCO SWU Value ($US per SWU)	66	65	66
US DOE SWU prices: ($US per SWU)			
USC	121.50[1]	121.50[1]	117.85[2]
AFC	153.00[3]	153.00[3]	153.00[3]
Requirements	157.00[3]	157.00[3]	157.00[3]
Incentive Price (IP2)	104.67[4]	104.67[4]	100.68[5]
Calculated worth of enriched UF_6[6]: ($US per KgU as UF_6)			
2.0 $^{w}/_{o}$ ^{235}U	209	208	218
2.5 $^{w}/_{o}$ ^{235}U	294	291	305
3.0 $^{w}/_{o}$ ^{235}U	381	377	395
3.5 $^{w}/_{o}$ ^{235}U	470	465	486
4.0 $^{w}/_{o}$ ^{235}U	560	555	579
4.5 $^{w}/_{o}$ ^{235}U	652	646	673

[1] Effective 10/1/91.
[2] Effective 10/1/89 to 9/30/91.
[3] Effective since 10/1/84.
[4] Provisional IP2 for FY92: Effective 10/1/91 to 9/30/92, for up to 30% of annual requirements.
[5] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.
[6] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 $^{w}/_{o}$ ^{235}U tails assay.

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RECENT TRANSACTIONS

Uranium Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5498	1995-2000	1,001-3,000	See remarks	Utility	Producer	Base Escalated Occurred earlier in 1992
5499	1992	101-300	98-102	Utility	Intermediary	
5500	1992	101-300	98-102	Utility	Intermediary	
5501	1992	101-300	98-102	Producer	**R**	
5502	1992	301-600	103-110	**R**	Intermediary	
5503	1992	101-300	98-102	Producer	Intermediary	
5504	1992-1993	1,001-3,000	98-102	Utility	Intermediary	
5505	1993-1994	101-300	**R**	Utility	Intermediary	
5506	1992	101-300	98-102	Intermediary	Intermediary	UF_6
5507	1993	50-100	98-102	Utility	Intermediary	UF_6
5508	1992	301-600	98-102	Producer	**R**	
5509A	1993	101-300	See remarks	Utility	Intermediary	Contained in EUP
5512	1992	101-300	98-102	Producer	Intermediary	
5513	1992	101-300	98-102	Producer	Intermediary	
5514A	1993	301-600	See remarks	Utility	Fabricator	Contained in EUP
5518	1992	101-300	98-102	Utility	Intermediary	
5519	1992	101-300	98-102	Utility	Intermediary	

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Exchange Value or UF_6 Value. The endpoints of each range are included within that range.

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MARKET REVIEW

RECENT TRANSACTIONS

Natural Uranium Loans[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Loan Rate	Borrower	Lender	Remarks
5510	1992	101-300	98-102	Intermediary	Utility	UF_6
5511	1992	301-600	98-102	Intermediary	Utility	UF_6

Conversion Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range[2] of Current Conversion Value	Buyer	Seller	Remarks

No Conversion sales are reported

Enrichment Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity[3] (thousand SWU)	Price Within Percentage Range[2] of Current SWU Value[4]	Buyer	Seller	Remarks
5509B	1993	Less than 50	See remarks	Utility	Intermediary	Contained in EUP
5514B	1993	50-100	See remarks	Utility	Fabricator	Contained in EUP
5516	1993	Less than 50	98-102	Utility	Intermediary	
5517	1992	Less than 50	98-102	Utility	Intermediary	

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

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[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., **X** dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

Uranium Supply

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Quantity (Thousand Pounds equivalent U_3O_8) Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
90-1078A*	235	—	1992-1993	UF_6e
91-1505*	1,250	—	1992-1993	
91-1507	500	—	1992	
91-1511	1,305	—	1992	UF_6/UF_6e
91-1512*	785	—	1992	UF_6
92-1194	200	—	1992	
92-1201A*	840	—	1993	UF_6e
92-1501A*	915	—	1992	UF_6e
92-1509	500	—	1992	U_3O_8/UF_6
92-1512*	500	—	1992	
91-1268	—	600 per year	1992-1999	
92-1129*	—	2,600 per year	1993-1999	
92-1185*	—	2,600 per year	1993-1999	
TOTAL	**7,030**			
INACTIVE	**3,050**			
AVAILABLE TO LOAN:				
ACTIVE				
92-1072	1,600	—	1992	UF_6
92-1074*	1,000	—	1992	
92-1195*	250	—	1992	
92-1214*	400	—	1992	
92-1503	2,000	—	1992	
TOTAL	**5,250**			
INACTIVE	**2,220**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: 92-1077, 92-1114, 92-1183, 92-1187

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SUPPLY AND DEMAND

Uranium Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8)		Delivery Period	Remarks
	Spot or Near-term[1]	Intermediate or Long-term[2]		
INQUIRIES TO PURCHASE:				
ACTIVE				
92-1152A	15	—	1993	UF_6e
92-1225*	600	—	1992-1993	
92-1227*	270	—	1992	U_3O_8/UF_6
91-1184	—	350 per year	1993-1997	
91-1197	—	2,210	1992-1997	U_3O_8/UF_6
92-1164A	—	785 per year	1996-2001	UF_6e
92-1199*	—	2,000	1992-1999	
92-1223*	—	400 per year	1997-2000	U_3O_8/UF_6
92-1226*	—	300 per year	1994-1996	
TOTAL	**885**			
INACTIVE	**1,185**			
INQUIRIES TO BORROW:				
ACTIVE				
92-1505	500	—	1992	
92-1511	750	—	1992	
TOTAL	**1,250**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: 92-1158, 92-1188, 92-1189, 92-1196, 92-1032, 92-1197, 91-1267, 91-1290

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SUPPLY AND DEMAND

Conversion Supply and Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF_6) Within 3 Years	Beyond 3 Years	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1500	400	—	1992	
91-1501	1,100	—	1992	
92-1507*	500	—	1992	
92-1190	660	—	1993	
TOTAL	**2,660**			
INACTIVE	*None reported*			
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1275	620	—	1992-1993	
92-1178	—	3,300 per year	1992-1995	
TOTAL	**620**			
INACTIVE	**2,205**			

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: *none*

SUPPLY AND DEMAND

SWU Supply and Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Quantity (Thousand Pounds equivalent U_3O_8) Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
90-1078B*	75	—	1992-1993	UF_6e
91-1509	200	—	1992	
91-1515*	100	—	1992	
92-1201B*	180	—	1993	UF_6e
92-1501B	130	—	1992	UF_6e
92-1124	250	250 per year	1992-1994	
TOTAL	**935**			
INACTIVE	*None reported*			
INQUIRIES TO PURCHASE:				
ACTIVE				
92-1152B	5	—	1993	UF_6e
90-1196	—	60 per year	1995 on	
91-1152	—	2,700	1995-2001	
92-1016	—	170 per year	1996-2006	
92-1164B	—	180 per year	1996-2001	UF_6e
TOTAL	**5**			
INACTIVE	**140**			

* New or revised since last month

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: 92-1191

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES[1]

Australia *to* Hungary	Australia (dollar)	Belgium (franc)	Canada (dollar)	China (renminbi)	CSFR (koruna)	EC (ecu)	Finland (markka)	France (franc)	Germany (mark)	Hungary (forint)
EXCHANGE VALUE										
per pound equivalent U_3O_8 as Concentrates										
This Month (July 31, 1992)	**10.41**	**235.42**	**9.16**	**42.39**	**208.24**	**5.61**	**31.35**	**38.60**	**11.43**	**589.47**
Last Month (June 30, 1992)	10.36	243.02	9.29	42.39	210.80	5.77	32.17	39.73	11.81	595.66
12 Months Ago (July 31, 1991)	10.98	307.00	9.84	45.72	—.—	7.28	35.89	50.68	14.90	—.—
per kg U as Concentrates										
This Month (July 31, 1992)	**27.07**	**612.04**	**23.82**	**110.21**	**541.38**	**14.58**	**81.50**	**100.34**	**29.71**	**1,532**
Last Month (June 30, 1992)	26.92	631.81	24.16	110.21	548.03	14.99	83.64	103.29	30.71	1,549
12 Months Ago (July 31, 1991)	28.53	798.14	25.58	118.86	—.—	18.92	93.30	131.75	38.75	—.—
UF_6 VALUE										
per kg U as UF_6										
This Month (July 31, 1992)	**31.58**	**713.85**	**27.78**	**128.55**	**631.45**	**17.00**	**95.06**	**117.03**	**34.66**	**1,787**
Last Month (June 30, 1992)	31.53	740.04	28.30	129.09	641.92	17.56	97.97	120.99	35.97	1,814
12 Months Ago (July 31, 1991)	33.06	924.60	29.64	137.69	—.—	21.91	108.08	152.62	44.88	—.—
TRANSACTION VALUE										
per pound equivalent U_3O_8 as Concentrates										
This Month (July 31, 1992)	**10.41**	**235.42**	**9.16**	**42.39**	**208.24**	**5.61**	**31.35**	**38.60**	**11.43**	**589.47**
Last Month (June 30, 1992)	10.42	244.59	9.35	42.67	212.16	5.80	32.38	39.99	11.89	599.51
12 Months Ago (July 31, 1991)	11.75	328.55	10.53	48.93	—.—	7.79	38.41	54.23	15.95	—.—
per kg U as Concentrates										
This Month (July 31, 1992)	**27.07**	**612.04**	**23.82**	**110.21**	**541.38**	**14.58**	**81.50**	**100.34**	**29.71**	**1,532**
Last Month (June 30, 1992)	27.10	635.88	24.31	110.92	551.57	15.09	84.18	103.96	30.91	1,559
12 Months Ago (July 31, 1991)	30.54	854.15	27.38	127.20	—.—	20.24	99.85	140.99	41.46	—.—
CONVERSION VALUE										
per pound U as UF_6										
This Month (July 31, 1992)	**2.02**	**45.57**	**1.77**	**8.21**	**40.31**	**1.09**	**6.07**	**7.47**	**2.21**	**114.09**
Last Month (June 30, 1992)	2.00	47.04	1.80	8.21	40.80	1.12	6.23	7.69	2.29	115.29
12 Months Ago (July 31, 1991)	1.93	53.86	1.73	8.02	—.—	1.28	6.30	8.89	2.61	—.—
per kg U as UF_6										
This Month (July 31, 1992)	**4.44**	**100.45**	**3.91**	**18.09**	**88.86**	**2.39**	**13.38**	**16.47**	**4.88**	**251.53**
Last Month (June 30, 1992)	4.42	103.70	3.97	18.09	89.95	2.46	13.73	16.95	5.04	254.17
12 Months Ago (July 31, 1991)	4.25	118.74	3.81	17.68	—.—	2.81	13.88	19.60	5.76	—.—
SWU VALUE										
per SWU at 0.30 w/o ^{235}U Tails Assay										
This Month (July 31, 1992)	**88.69**	**2,005**	**78.03**	**361.02**	**1,773**	**47.75**	**266.97**	**328.69**	**97.33**	**5,020**
Last Month (June 30, 1992)	86.85	2,038	77.94	355.55	1,768	48.36	269.84	333.23	99.07	4,996
12 Months Ago (July 31, 1991)	84.72	2,370	75.97	352.91	—.—	56.17	277.03	391.18	115.04	—.—

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[1] Calculated using currency exchange rates **for** the last business day of the month, as published in *The Wall Street Journal*.

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES[1]

Italy *to* **United States**	**Italy** (lira)	**Japan** (yen)	**Netherlands** (guilder)	**S. Africa** (comm. rand)	**S. Korea** (won)	**Spain** (peseta)	**Sweden** (krona)	**Switzerland** (franc)	**Taiwan** (dollar)	**UK** (pound)	**USA** (dollar)
EXCHANGE VALUE											
per pound equivalent U_3O_8 as Concentrates											
This Month (July 31, 1992)	**8,643**	**985.00**	**12.89**	**21.43**	**6,102**	**728.66**	**41.51**	**10.22**	**191.35**	**4.02**	**7.75**
Last Month (June 30, 1992)	8,935	974.72	13.31	21.48	6,124	745.91	42.68	10.65	188.90	4.07	7.75
12 Months Ago (July 31, 1991)	11,124	1,175	16.80	24.49	6,255	933.20	54.08	13.02	227.51	5.07	8.55
per kg U as Concentrates											
This Month (July 31, 1992)	**22,469**	**2,561**	**33.50**	**55.72**	**15,865**	**1,894**	**107.92**	**26.57**	**497.46**	**10.46**	**20.15**
Last Month (June 30, 1992)	23,228	2,534	34.61	55.84	15,921	1,939	110.95	27.70	491.09	10.58	20.15
12 Months Ago (July 31, 1991)	28,920	3,054	43.69	63.67	16,263	2,426	140.60	33.85	591.49	13.18	22.23
UF_6 VALUE											
per kg U as UF_6											
This Month (July 31, 1992)	**26,207**	**2,987**	**39.08**	**64.99**	**18,504**	**2,209**	**125.87**	**30.99**	**580.22**	**12.20**	**23.50**
Last Month (June 30, 1992)	27,208	2,968	40.54	65.41	18,649	2,271	129.96	32.44	575.22	12.40	23.60
12 Months Ago (July 31, 1991)	33,502	3,538	50.61	73.76	18,840	2,811	162.87	39.22	685.20	15.27	25.75
TRANSACTION VALUE											
per pound equivalent U_3O_8 as Concentrates											
This Month (July 31, 1992)	**8,643**	**985.00**	**12.89**	**21.43**	**6,102**	**728.66**	**41.51**	**10.22**	**191.35**	**4.02**	**7.75**
Last Month (June 30, 1992)	8,992	981.01	13.40	21.62	6,164	750.72	42.95	10.72	190.11	4.10	7.80
12 Months Ago (July 31, 1991)	11,905	1,257	17.98	26.21	6,694	998.69	57.87	13.94	243.48	5.43	9.15
per kg U as Concentrates											
This Month (July 31, 1992)	**22,469**	**2,561**	**33.50**	**55.72**	**15,865**	**1,894**	**107.92**	**26.57**	**497.46**	**10.46**	**20.15**
Last Month (June 30, 1992)	23,378	2,550	34.84	56.20	16,024	1,952	111.66	27.87	494.25	10.65	20.28
12 Months Ago (July 31, 1991)	30,950	3,268	46.75	68.14	17,404	2,596	150.46	36.23	633.00	14.10	23.79
CONVERSION VALUE											
per pound U as UF_6											
This Month (July 31, 1992)	**1,673**	**190.65**	**2.49**	**4.15**	**1,181**	**141.03**	**8.03**	**1.98**	**37.04**	**0.78**	**1.50**
Last Month (June 30, 1992)	1,729	188.66	2.58	4.16	1,185	144.37	8.26	2.06	36.56	0.79	1.50
12 Months Ago (July 31, 1991)	1,952	206.07	2.95	4.30	1,097	163.72	9.49	2.28	39.91	0.89	1.50
per kg U as UF_6											
This Month (July 31, 1992)	**3,688**	**420.30**	**5.50**	**9.15**	**2,604**	**310.92**	**17.71**	**4.36**	**81.65**	**1.72**	**3.31**
Last Month (June 30, 1992)	3,812	415.91	5.68	9.17	2,613	318.28	18.21	4.55	80.60	1.74	3.31
12 Months Ago (July 31, 1991)	4,303	454.31	6.50	9.47	2,419	360.94	20.92	5.04	88.00	1.96	3.31
SWU VALUE											
per SWU at 0.30% ^{235}U Tails Assay											
This Month (July 31, 1992)	**73,603**	**8,388**	**109.74**	**182.52**	**51,969**	**6,205**	**353.51**	**87.03**	**1,630**	**34.26**	**66.00**
Last Month (June 30, 1992)	74,937	8,175	111.66	180.16	51,363	6,256	357.93	89.35	1,584	34.15	65.00
12 Months Ago (July 31, 1991)	85,870	9,067	129.72	189.06	48,288	7,204	417.46	100.52	1,756	39.13	66.00

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[1] Calculated using currency exchange rates **for** the last business day of the month, as published in *The Wall Street Journal*.

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RECENT DEVELOPMENTS

USA

USCEA Nuclear Fuel Supply Forum

Over 120 people attended the summer meeting of the US Council for Energy Awareness Nuclear Fuel Supply Forum in Washington, DC. Peter LeRoy, Licensing Manager for Louisiana Energy Services (LES), presented a status report on the company's progress in licensing its Louisiana enrichment plant scheduled for commercial operation in 1996. He indicated that a number of contentions from CANT (an environmental intervenor group), granted by the NRC's Atomic Safety and Licensing Board (ASLB), necessitate a hearing that could delay receipt of the LES construction license.

Troy Wade of International Disarmament Corporation spoke about Russian highly enriched uranium (HEU) available from dismantled nuclear weapons. He presented a pessimistic view of the timetable for its availability to the commercial market, the delay caused by a requirement for US verification and safeguards procedures at each stage of disassembly. Mr. Wade predicted extended discussions between the Russian and the US governments on these issues. He estimated the weapons material would not become available until after the year 2000 and would be available only in small quantities.

Frank Sailer from the Department of Commerce (DOC) spoke about anti-dumping procedures. While reviewing the schedule for the remainder of the year, Mr. Sailer noted there have been rumors of a settlement. He indicated that a settlement is the only way to bring a case to conclusion. If a suspension agreement, instead of a settlement, is reached, the dumping investigations of DOC and the International Trade Commission (ITC) normally would cease. However, any party to the agreement may request DOC and ITC to continue their investigations and to make a determination, as if the suspension agreement had not been made. If a conclusion is reached that dumping has, in fact, occurred, and if a violation occurs to the suspension agreement, DOC can immediately institute dumping duties.

Mr. Sailer was asked whether the Department has considered the substantial transformation issue. He responded that Commerce has not resolved the issue yet, but that he could envision a situation in which Russian U_3O_8 shipped to a third party, converted (substantially transformed), and imported into the United States could be assessed a duty on the value of the CIS portion of the material before conversion. He also was asked about duty on enriched uranium product (EUP) imported for fabrication into fuel pellets to be exported. Sailer responded that the material could be shipped into the US for fabrication, but that the owner of the EUP would have to pay the duty even if the material were exported later.

Mr. Sailer was asked about origin swaps and how DOC would prevent circumvention of the dumping order. He said DOC needs to investigate the issue further and he could not specify what action is contemplated, other than to say that there are specifically defined situations that DOC can investigate and in which it can intervene to prevent circumventions.

He also was asked why DOC ignored the information provided by the utilities in making its preliminary decision on the dumping issue. He responded that, for purposes of the DOC investigations into dumping, consumer interests, as represented by the utilities, are irrelevant. However, since it is the function of the ITC to look at the effects on the domestic industry, it could consider consumer interests. He clarified that DOE's input was evaluated by the Commerce Department because DOE is a producer.

Mr. Sailer ended his remarks noting that, from DOC's standpoint, a settlement with the republics is not the preferred solution because it is difficult to administer. Nevertheless, he asserted that if there is a settlement, it must be monitorable, in the public interest, and fairly settled.

The final panel of the Forum moderated by K. P. Lau of American Nuclear Energy Council. Wes Warren of the House Energy & Power Subcommittee, and Sam Fowler of the Senate Energy committee, presented a status report on the National Energy bill (HR776), which includes the uranium enrichment restructuring title. Both speakers stressed that time is of the essence, as there is little legislative time left before campaigning begins. Further, Congress' first priority is to pass appropriations to keep the government operating beyond September. If a conference committee is to have enough time to work out a compromise, the Senate must pass the bill before the August recess. Some analysts are fairly pessimistic about the bill's chances.

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WASHINGTON FOCUS

by Linda L. Gunter

During July, Senate consideration of the National Energy Strategy bill (HR 776) was delayed by efforts to arrive at a compromise on several issues: DOE's desire to expedite its characterization of the Yucca Mountain spent fuel repository over the objections of Nevada's congressional delegation; and negotiation between Sen. Jay Rockefeller (D-WV) and Sen. Malcolm Wallop (R-WY) regarding a Rockefeller coal tax amendment that would require Western coal companies to contribute to Eastern coal miner pension funds. The Senate Energy & Water committee acted on DOE's FY1993 appropriations bill, and in a surprise move, committee chairman Bennett Johnston (D-LA) amended the bill by attaching both HR 776 and S 2166 to it, in order to force a showdown with the Nevada senators.

Senate Energy Bill Debated

◇ On July 23, a Senate vote on whether to consider the Energy bill before its August recess failed. For much of July there had been a number of objections (holds) on the bill, including complaints by the Nevada delegation about House bill language to move forward with characterization of Yucca Mountain, and a controversy over payments to Eastern coal miner pension funds from Western coal companies. On July 27, consent was finally achieved to begin debate on the bill. Conferees should be appointed in August so that committee staff can begin to draft a compromise bill. However, with limited time after the August recess before the election recess in mid-October and with so many bills left to enact, there may not be enough time to arrive at a compromise on the Energy bill. If it looks as though a final vote on the bill may not occur, Sen. Wendell Ford (D-KY) almost certainly will amend any other House-passed bill with the uranium enrichment bill to force the House into a conference on the issue this year.

Russian HEU

◇ On July 2, while the Senate considered the Freedom Support Act (a bill to provide assistance to the former Soviet Union), Sen. Alan Simpson (R-WY) offered an amendment to the act regarding Russia's weapons-grade uranium that may be sold in the commercial market. The amendment, which was approved, is a Sense of the Congress amendment that is considered an advisory communication to the Executive Branch. It asks the President to minimize the disruption to international uranium markets from sale of Russian HEU.

GAO Uranium Industry Report

◇ At the same time, Sen. Simpson released the US General Accounting Office's (GAO) report entitled "Unresolved Trade Issues Leave Uncertain Future for US Uranium Industry". The report concludes that the domestic industry faces an uncertain future and that the US Department of Energy (DOE) cannot be expected to create any new demand for uranium, since the government has large inventories and may someday convert its own excess HEU to commercial fuel. The report notes that while imports of CIS uranium now represent 17 percent of the US nuclear requirements, "the majority of US imports of foreign uranium continue to come from other countries such as Canada and Australia". The report also notes total US imports of natural and enriched uranium have increased over the last decade.

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The GAO report presents DOE's unclassified uranium inventory numbers as of the end of FY 1991. DOE has 12,294 metric tons (MT) of enriched uranium; 60,158 MT of natural uranium; and 380,681 MT of depleted uranium. Some of the natural uranium is actual utility feed to meet contracts, but DOE has 13,400 MT available for overfeeding. For the past four fiscal years, DOE has used about 3,300 MT each year as overfeed to reduce production costs. Under a cost optimization model, DOE plans to continue overfeeding for the next ten years.

The GAO report notes an interagency review group is currently considering the US government's options for its HEU. DOE's Office of Nuclear Materials will complete later this year a plan to consider strategic and inventory requirements. The GAO report also discusses Russian HEU, noting that high-level intergovernmental discussions are ongoing, with the Russian side expressing the willingness to sell the material and the US side interested in purchasing in order to reduce nuclear proliferation concerns.

Senate Subcommittee Approves DOE & NRC Appropriations Bill

◇ On July 21, the Senate Energy & Water Subcommittee approved its version of HR 5373, Appropriations for FY 1993 for DOE and the Nuclear Regulatory Commission (NRC). The Senate amount is approximately $22 billion, or almost $700 million greater than the bill passed by the House. Most of the additional money went to funding the Superconducting Supercollider Project, which the House had refused to fund. The subcommittee held most of the nuclear research and development programs at the same levels as those included in the House version of the bill, which represent reduced amounts from DOE's request.

In the Senate bill, uranium enrichment program appropriations were reduced an additional $14 million from the House bill, bringing the Senate's total program reduction to $70 million less than DOE's request. As in prior years, the committee noted DOE's efforts to restructure the enterprise, but insisted DOE begin predeployment activities for AVLIS. The Senate bill's AVLIS budget received a $10 million boost compared to the House budget, but is still $20 million short of DOE's request. The report specifies the action DOE must take on AVLIS. DOE is directed to select a commercial deployment contractor competitively by April 1, 1993, to direct the following pre-deployment activities:

1. Develop a transition plan to move the program from the laboratory into production.
2. Confirm technical performance.
3. Provide industrial perspective on the remaining demonstration activities.
4. Complete commercialization and risk studies.
5. Begin site selection, characterization, and EIS activities.
6. Proceed with engineering design of the plant.
7. Initiate NRC licensing activities.
8. Integrate AVLIS technology into the commercial fuel cycle.

The Senate committee agreed with the House and ignored DOE's request to create a environmental cleanup fee from utilities. Finally, the committee took $50 million of DOE's uncosted obligations from its enrichment program (revenue from earlier years) to pay for other programs funded by the Energy and Water bill. In total, the Senate moved $140.68 million from DOE's enrichment account to the Treasury. This amount is less than the $233.4 million removed from the account in FY 1992.

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INDUSTRY BRIEFS

Ontario Hydro Restarts Darlington 1

Ontario Hydro put its Darlington 1 881-MWe heavy water reactor back into service on July 13, after receiving approval from Canada's Atomic Energy Control Board (AECB). The reactor first went into pre-commercial testing in 1991, but had operated only sporadically, partly due to testing schedules, and partly to fuel channel problems first discovered in Unit 2 (the first Darlington unit to begin operation). Both reactors had been shut down since January 1992 to resolve a resonant frequency problem that had caused fuel bundle end plates to crack and led to excessive wear of bearing pads used to support pressure tubes. Ontario Hydro determined that five-bladed impeller pumps in the heat transport system were causing the problem, and replaced the impellers with seven-bladed models, reducing pressure pulse levels by a factor of three. The AECB approved Unit 1 for restart after this change, although it expressed some doubt as to whether this change will entirely solve the bearing pad problems. Consequently, the AECB will closely follow the initial restart results.

Due to governmental spending limits and the testing of new computer controls, the station is already five years behind and nearly 40 percent over budget. Ontario Hydro hopes to have all four Darlington units in operation before 1994.

Second Public Group Approves Phase II MRS Study

A Fremont County, Wyoming, advisory group has recommended that the county seek a Phase II-A grant from the Department of Energy to study further the possibility of siting DOE's Monitored Retrievable Storage (MRS) facility in the county. The 17-member advisory panel concluded that the potential economic benefits of the facility warranted additional examination. Fremont County is the second group to proceed to Phase II; the Mescalero Apache Tribe of New Mexico is proceeding with Phase II-A studies, and also is talking to New Mexico state officials who oppose the MRS facility. Wyoming governor Bill Sullivan and Senator Alan Simpson have not commented on the Fremont County studies so as not to bias the process.

◆ ◆ ◆

House Approves WIPP Land Transfer

The US House of Representatives voted on July 21 to transfer more than ten thousand acres of public land near Carlsbad, New Mexico, to the Department Of Energy. The 382-10 vote will enable DOE to begin storing nuclear waste at the Waste Isolation Pilot Plant (WIPP) in the salt caverns near Carlsbad. Initially, only relatively small amounts of transuranic waste from the country's nuclear weapons sites will be stored on a test basis.

Saskatchewan Uranium Review Panel Requests Far-Reaching Information

The Uranium Saskatchewan Association has warned the new Uranium Mine Development Review Panel (UMDRP) of Saskatchewan that the pursuit of answers to "irrelevant" questions in the UMDRP reviews could cause significant delays in review process. This, in turn, would delay new uranium projects, harm the province's largest industry, and could jeopardize the Saskatchewan economy. The Association also noted that it was assured by the UMDRP that project reviews would be completed in 18 months, but that these unnecessary questions make it less likely the deadlines would be met. In its letter to the UMDRP, the Association emphasized that the review panel "has not been given a mandate to investigate matters that are not directly related to the proposed developments." The Association pointed to guidelines, still only in draft form, issued to Cameco for the Cigar Lake and McArthur River projects, which request Cameco to discuss and evaluate such issues as "the social functioning of communities, substance abuse, crime and violence, family abuse, mental health problems, stress-related illness... the socio-economic status of women...," issues that appear to be unrelated to the development of the projects.

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NSP's Prairie Island Gets Fuel Storage Reprieve

On June 26, Northern States Power Company (NSP) received approval from the Minnesota Public Utility Commission (PUC) to purchase 17 above-ground storage casks for its Prairie Island station. This approval was critical, since without some form of additional spent fuel storage at the station, the fuel pools at the site would have been full by 1995, effectively leading to the shutdown of the reactors. While additional storage capacity was necessary, the PUC believed it was unlikely that DOE would begin accepting spent fuel by 1998, and feared that the temporary storage casks could become a *de facto* longer-term storage area. Thus, the PUC approved the purchase of only 17 casks of the 48 requested, as a way to keep pressure on DOE to make progress on a permanent waste repository.

The Prairie Island issue has become a focal point on whether DOE is legally obligated to take possession of spent fuel on January 31, 1998. Donald Hodel, former Secretary of Energy, recently stated that the intent of the contracts signed in 1984 between the utilities and DOE (under Mr. Hodel) was that DOE was obligated to take possession of spent fuel in 1998, regardless of the completion of-a repository. However, current DOE officials have backtracked, stating that DOE is only obligated to take possession when a facility is complete. Numerous delays already have pushed DOE's target date for completion of a facility to 2010.

IMC Closes Uranium Recovery Operations

IMC Fertilizer Inc. announced on July 1 that it was commencing a phased shutdown of the 12-year old uranium recovery operation at its New Wales, Florida phosphate chemical facility, and that some uranium operations at its Plant City facility had already been shut down. IMC was recovering about two million pounds U_3O_8 equivalent per year from the two by-product facilities, with most of the output sold under long-term contracts. However, the contracts have expired and IMC is mothballing the uranium operations until market prices increase—by an unspecified amount. IMC cited the same market reasons when it closed uranium operations at its Barstow facility in 1985.

Ontario Hydro Ends 30-Year CNA Membership

Ontario Hydro has decided not to renew its membership in the Canadian Nuclear Association (CNA) after the current membership expires at the end of 1992. Marc Eliesen, chairman of Ontario Hydro, stated the company's position that "it is inappropriate for Ontario Hydro to support, or give preference to, external organizations which ... (advocate a) preference for any one particular form of generation vis-a-vis another." Citing the same reasons, Ontario Hydro will also be ending its membership in the Independent Power Producers Society of Ontario, the Canadian Renewable Energy Association, and several other groups.

Such actions appear to be directly in line with the anti-nuclear attitude of the new government controlled by the New Democratic Party (NDP). However, Eliesen claimed that the review of such memberships was initiated several years earlier, and the decision not to renew the memberships was not due to any NDP policy.

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JAPAN NUCLEAR FUEL, LTD.

Just over a month ago, on July 1, Japan Nuclear Fuel Industries (JNFI) and Japan Nuclear Fuel Services (JNFS) merged to form the integrated nuclear fuel cycle company, Japan Nuclear Fuel, Ltd. (JNFL). The announcement in mid-January that the country's two major fuel cycle firms intended to merge had long been anticipated and represents one of the most significant restructuring events in Japan's nuclear industry. The merger forming JNFL was a logical progression in the evolution of Japan's fuel cycle, bringing complementary technologies together to encourage synergism, increased efficiency, and improved community relations.

The main production facilities of both JNFI and JNFS were located near the village of Rokkashomura, on the northern end of the main island of Honshu (**Figure 1**), and their headquarters were in Tokyo. The former JNFS was responsible for spent fuel reprocessing and also was building a high-level waste (HLW) management facility. The former JNFI focused on uranium enrichment and low-level waste (LLW) disposal. It was operating the first stage of a centrifuge enrichment plant and continuing to construct additional capacity. These responsibilities and activities will be assumed by JNFL, which now will be responsible for all JNFI and JNFS operations, including those at Rokkashomura.

JAPAN'S FUEL CYCLE STRATEGIES AND POLICIES

Japan's primary goal in its overall energy strategy is to reduce the country's dependence on imported energy supplies. This goal has been at the center of Japan's strategy since the oil crisis of the early 1970s and was reinforced by the supply disruption caused by the Gulf War. Japan's desire is to reduce its dependence on oil and concentrate on energy supply diversification and conservation. In order to accomplish this goal, the Ministry of International Trade and Industry (MITI) has emphasized nuclear power, saying it should be developed "to the greatest extent possible." In its most recent long-term plan, the government announced its intent to more than double installed nuclear capacity, to 72,500 MW (gross) by the year 2010, even though only about 25 percent of the additional plants necessary to meet this goal are under construction or have plans approved.

The goal to reduce its dependence on energy imports was the driving force behind the country's decision to adopt a closed fuel cycle. Japan is committed to reprocessing and recycling spent fuel to reduce further its dependence on non-domestic fuel supplies, and to developing a complete domestic nuclear fuel cycle. This policy led to the decision to establish the fuel cycle complex at Rokkashomura, complete with enrichment, reprocessing, and waste management facilities. The support provided by the policy also led to the development of a small experimental fast breeder reactor (FBR) at Joyo and the nearly-complete 280-MWe FBR prototype at Monju that eventually will utilize recycled fuel. The policy was likewise responsible for recent calls by utility leaders to build one new FBR per decade to use the energy available from recycled fuel. Several Japanese utilities have signed contracts with Cogema of France or British Nuclear Fuels, plc. (BNFL) of the United Kingdom to reprocess the utilities' spent fuel, until Japan develops enough domestic reprocessing capacity. The first domestically reprocessed fuel arrived at the Monju station in July 1992 from the reprocessing facilities at Tokaimura. The first foreign shipments of the reprocessed fuel and the related wastes are scheduled to arrive in Japan in 1993.

Japan also is active in research efforts directed toward different stages of the fuel cycle, and in promoting agreements for cooperation and information exchange. For example, JNFI concluded a cooperative agreement for information exchange on uranium enrichment with the US-based Martin Marietta Energy Systems and Urenco in Europe. Kansai Electric Power Company signed an information exchange agreement with Entergy Operations of the USA on nuclear power plant operation. Information exchange cooperation agreements regarding LLW disposal also have been reached with companies and organizations from Sweden, France, the UK, USA, Germany, and The Netherlands. Another example of its cooperative efforts is Japan's participation as one of three engineering centers for the International Thermonuclear Experimental Reactor

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(ITER) program, a combined fusion research and development effort of organizations from Japan, Europe, the USA, and the former Soviet Union.

ROKKASHOMURA

The Rokkashomura area in the Aomori prefecture first became well-known in 1979 when the Japanese government announced its decision to install the country's national oil reserve there as part of a major industrial development plan, entitled the Mutsu Ogawara Development Project. The area became more widely known when it became the site of the country's primary nuclear fuel cycle complex. In April 1984, the Federation of Electric Power Companies requested the cooperation of the Aomori Prefecture Authority in obtaining sites for three nuclear fuel cycle facilities. By April of the following year, both the Aomori prefecture and the village of Rokkashomura had given favorable replies, allocating 7.5 million square meters (2.9 square miles) for building sites. The same month, JNFI opened an office at Rokkashomura in preparation for construction work. The land purchase contract was concluded in 1986 and all the land finally transferred by 1988.

Figure 1
SHIMOKITA PENINSULA OF JAPAN'S AOMORI PREFECTURE

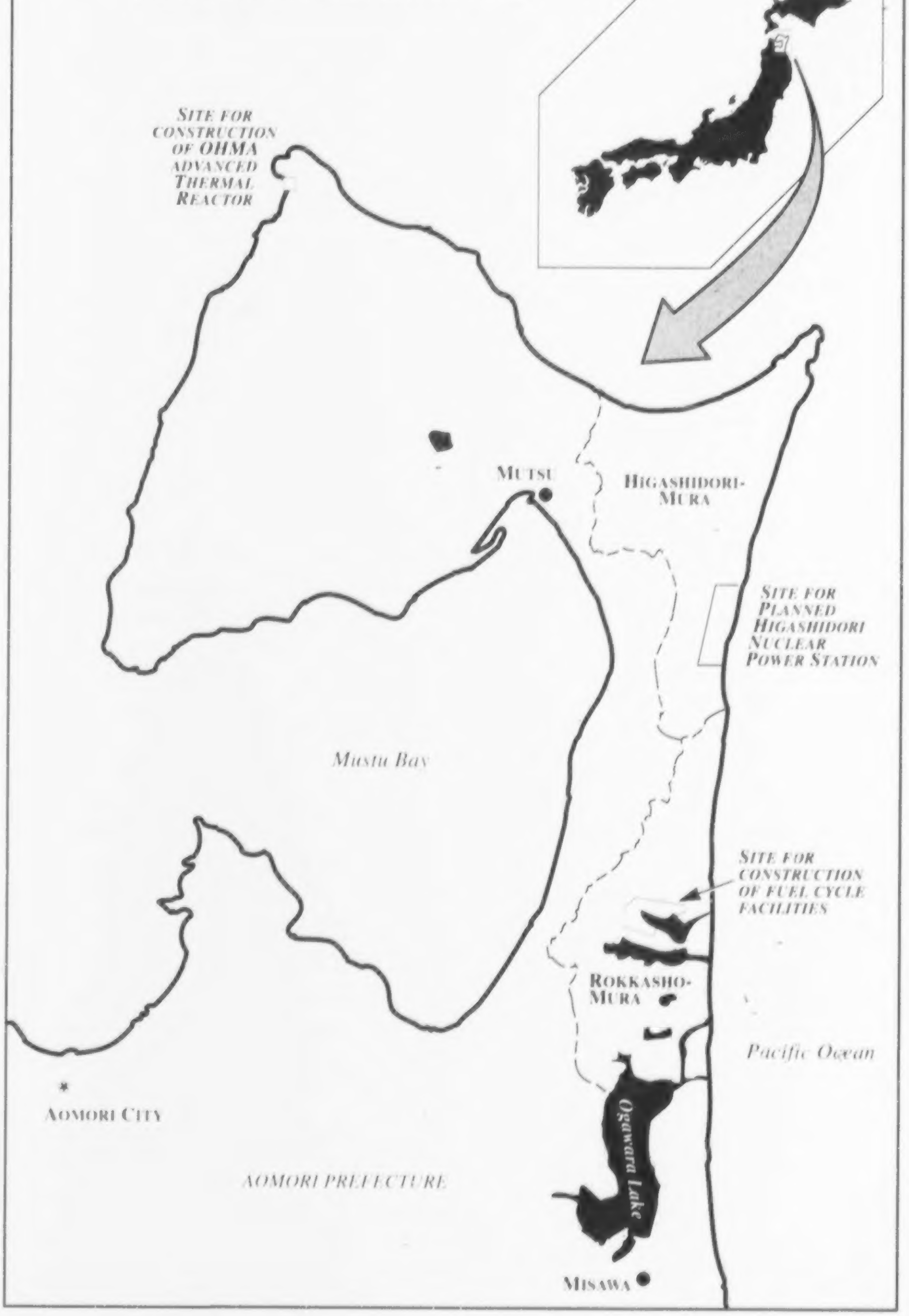
SITE FOR CONSTRUCTION OF OHMA ADVANCED THERMAL REACTOR
MUTSU
HIGASHIDORI-MURA
SITE FOR PLANNED HIGASHIDORI NUCLEAR POWER STATION
Mustu Bay
SITE FOR CONSTRUCTION OF FUEL CYCLE FACILITIES
ROKKASHO-MURA
Pacific Ocean
AOMORI CITY
Ogawara Lake
AOMORI PREFECTURE
MISAWA

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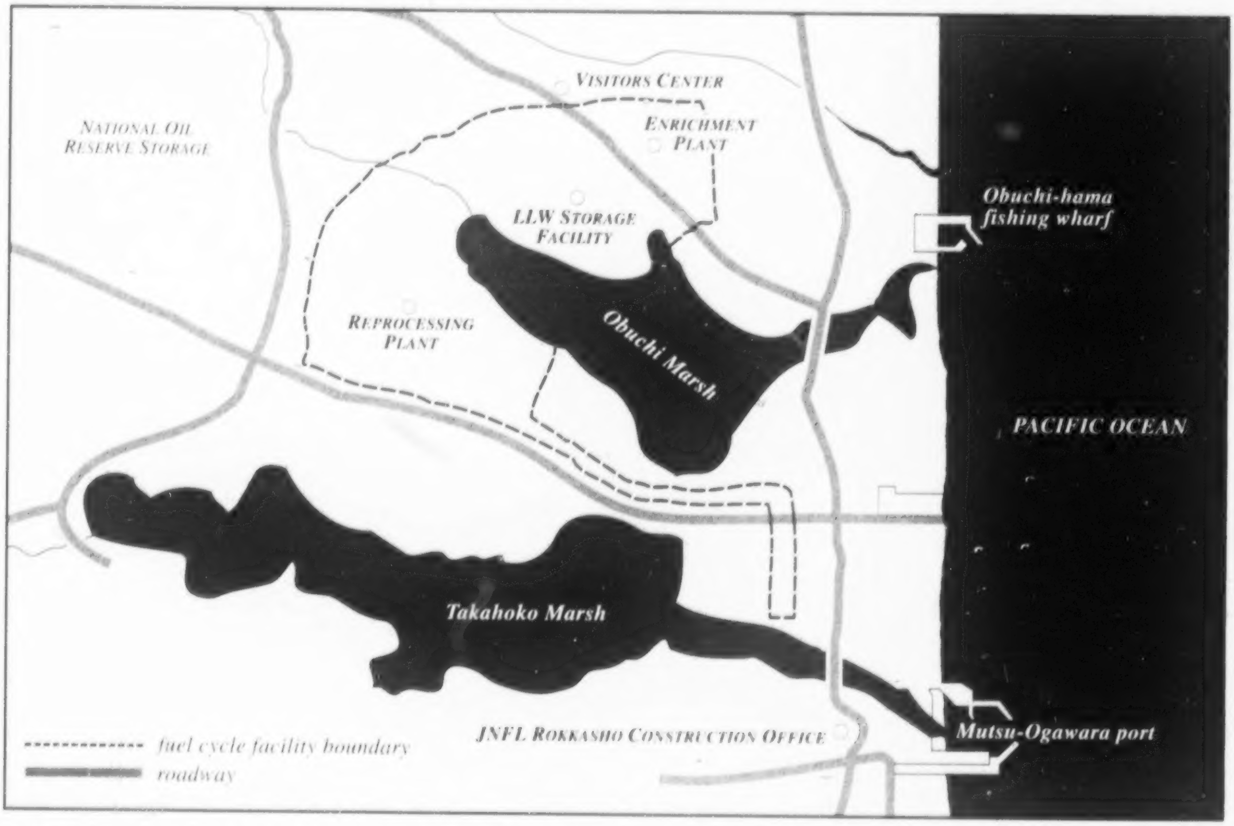
Figure 2
ROKKASHOMURA NUCLEAR FUEL COMPLEX


VISITORS CENTER
NATIONAL OIL RESERVE STORAGE
ENRICHMENT PLANT
LLW STORAGE FACILITY
REPROCESSING PLANT
Obuchi Marsh
Obuchi-hama fishing wharf
PACIFIC OCEAN
Takahoko Marsh
JNFL ROKKASHO CONSTRUCTION OFFICE
Mutsu-Ogawara port
fuel cycle facility boundary
roadway

When completed, the Rokkashomura complex will contain facilities for uranium enrichment, radioactive waste storage and disposal, and spent fuel reprocessing (**Figure 2**). Slightly to the south of the complex is the Mutsu Ogawara harbor, opened in November 1990, which will be used for unloading LLW and spent fuel casks to be processed at the Rokkashomura complex.

Because of the size of the fuel cycle complex and its importance to Japan's long-term energy plans, Rokkashomura has become a political focal point. Those opposed to expanding nuclear power have concentrated their efforts there, and government and industry have recognized that success of the projects at the site is critical to ensuring the long-term viability of the industry and the country's energy well-being. In 1989, nuclear opponents appeared to have achieved some moderate success: Rokkashomura elected a new mayor who supported freezing the fuel cycle project, and the local representative elected to the upper house of the Diet opposed the complex. However, subsequent elections have demonstrated that the majority of citizens from the Aomori prefecture are not opposed to the complex. The most crucial election occurred in the gubernatorial run-off of February 1991. After widespread and often spirited debate, incumbent governor Masaya Kitamura defeated two anti-nuclear opponents by a significant margin and vowed to continue the development project. Additionally, other prefecture elections held at the same time resulted in major gains by the Liberal Democratic Party (LDP), Japan's primary conservative political party, that supported the complex. Now, only four of 51 seats in the Aomori prefectural assembly oppose the complex. Clearly, the last election was an important win for the LDP and was viewed as an indication that the citizens of Aomori support the development in Rokkashomura.

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The siting of the fuel cycle complex already has brought economic benefits to the Rokkashomura region. In addition to the numerous jobs created and taxes received directly from the building of the complex, by the end of 1991, at least 18 new businesses representing 15 different companies had opened in Aomori prefecture. These establishments alone will create 2,400 new jobs in the area. Also, in July 1991, the Ministry of Home Affairs approved a new general tax in the Aomori prefecture, not stipulated in the local tax law, known as the "nuclear fuel material handling tax". It is similar to the nuclear fuel tax imposed by eleven other prefectures on nuclear power stations sited within their respective regions. The tax will be assessed on the fuel cycle complex operators at a rate of ¥7,100 per kilogram of enriched uranium produced by the facility and ¥29,800 per cubic meter of radioactive waste buried, and is estimated to yield ¥6.7 billion (US$53 million) in revenue over five years. Since revenue from general taxes not stipulated in local tax law is not subject to the restrictions placed on other prefectural taxes, the money created from this tax can be used to fund additional regional development programs and to improve the infrastructure of the area, making it more attractive to other businesses.

Given Japan's strategy to reduce its dependence on foreign energy sources and to develop a complete domestic fuel cycle for its nuclear program, the fuel cycle facilities of JNFL are of national importance. Correspondingly, a critical issue in promoting nuclear fuel cycle enterprises is to establish and maintain excellent community relations. The Japanese government and industry realize that the long-term success of the nuclear industry depends upon meeting community expectations for employment opportunities, educating the public about the industry, and alleviating the anxiety that may be created by growing nuclear-related businesses. To address these issues, both JNFI and JNFS had made concerted efforts to improve management of their businesses and to develop better public relations. A new public relations center at Rokkashomura is a prime example of the effort made to educate the public about the advantages and safety of nuclear power and the benefits of a supporting fuel cycle industry.

JNFL

Given the common sites and related technologies of their fuel cycle facilities, the merger of JNFI and JNFS was a logical step forward in promoting the nuclear industry. One of the primary reasons the companies merged was to present a united front and consistent public relations effort, thereby facilitating improved communication and understanding with the local community and the nation as a whole. The formation of JNFL and the relocation of its headquarters into Aomori City more closely unite the company with the community by demonstrating JNFL's commitment to the project, its concerted efforts to operate the facilities safely, and its intent to keep the citizens of the prefecture involved.

Aomori prefecture had long requested that JNFI and JNFS locate their head offices in Aomori, and that the two companies merge. After more than six months of study in 1991, on January 22, 1992, following meetings of the boards of directors of both JNFI and JNFS, the companies announced their intent to merge as of July 1, 1992. The new company, Japan Nuclear Fuel Ltd., is now headquartered in the prefecture and employs 960 people. Shoh Nasu, president of Tokyo Electric Power and also president of the World Association of Nuclear Operators, has been named chairman of JNFL. Vice-Chairman of JNFI and JNFS, Kiyoshi Nozawa, was appointed president of the new entity.

Once merged, the two former companies will be on an equal footing and each will remain responsible for their same areas of expertise, with the technology department of JNFS becoming the Reprocessing Division and JNFI's technology department becoming the Uranium Enrichment and LLW Division (**Figure 3**). The headquarters operations, public relations, and clerical departments of the two companies have each been consolidated with one another. The major nuclear utilities in Japan are the primary owners of JNFL (71 percent), with 150 other industry-related companies owning the remaining 29 percent (**Table 1**). Total capitalization of JNFL now totals ¥120 billion (US$950 million). Financing of the construction projects will be provided primarily by outside financial institutions, including loans from the Japan Development Bank, City Cooperation and Financing Organization, and Seiko Cooperation and Finance Organization. The Japanese government will remain involved closely with the project through MITI, helping to coordinate financing, regional development, public relations, and other activities to promote growth of the Japanese nuclear industry.

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Figure 3
BASIC CORPORATE STRUCTURE OF JNFL

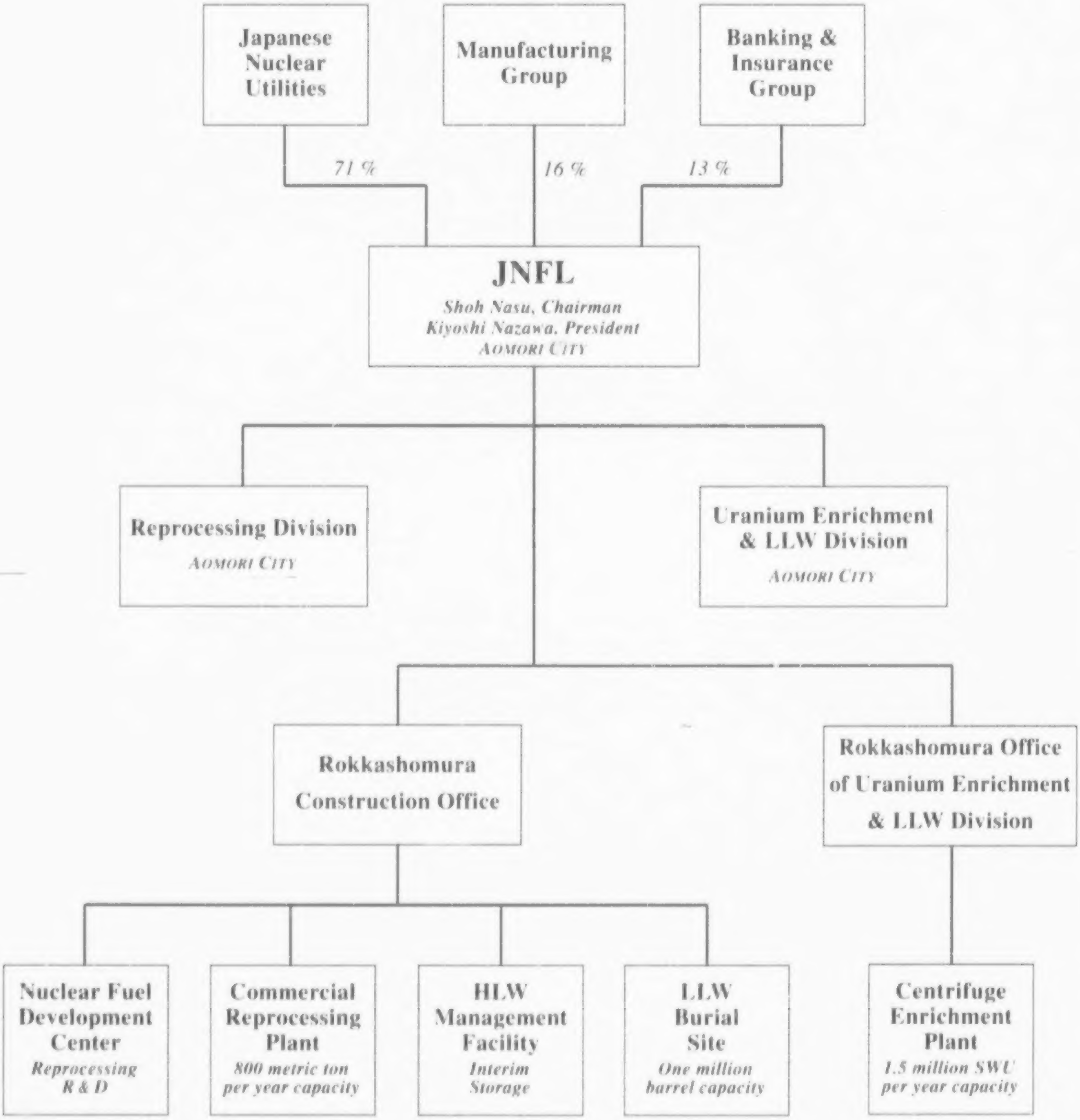
Japanese Nuclear Utilities
Manufacturing Group
Banking & Insurance Group
71 %
16 %
13 %
JNFL
Shoh Nasu, Chairman
Kiyoshi Nazawa, President
Aomori City
Reprocessing Division
Aomori City
Uranium Enrichment & LLW Division
Aomori City
Rokkashomura Construction Office
Rokkashomura Office of Uranium Enrichment & LLW Division
Nuclear Fuel Development Center
Reprocessing R & D
Commercial Reprocessing Plant
800 metric ton per year capacity
HLW Management Facility
Interim Storage
LLW Burial Site
One million barrel capacity
Centrifuge Enrichment Plant
1.5 million SWU per year capacity

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Table 1
OWNERSHIP OF JAPAN NUCLEAR FUEL, LTD.

Owner	Share
Tokyo EPC[1]	19.47%
Kansai EPC	12.78%
Chubu EPC	8.76%
Kyushu EPC	6.62%
Tohoku EPC	5.33%
Chugoku EPC	4.73%
Shikoku EPC	3.64%
JAPC[2]	3.53%
Hokkaido EPC	3.27%
Hokuriku EPC	2.87%
Utility Group subtotal	71.00%
Manufacturing Group[3]	16.00%
Banking and Insurance Group[4]	13.00%
Total	100.00%

[1] EPC=Electric Power Company

[2] JAPC=Japan Atomic Power Company. It is majority-owned by the nine other utilities shown.

[3] Includes companies such as Toshiba, Hitachi, and Mitsubishi Heavy Industries.

[4] Together with the Manufacturing Group, 150 companies share ownership of the 29% non-utility portion.

Reprocessing Division (formerly JNFS)

Japan Nuclear Fuel Services Company, Ltd. was established in 1980, with management of spent fuel from nuclear power stations as its focus. The company developed expertise in the areas of reprocessing and transportation of spent fuel, as well as high-level radioactive waste management, particularly regarding wastes from reprocessing. As the JNFL Reprocessing Division, former JNFS employees will continue to work in these same areas. Prior to the merger, more than ¥80 billion had been invested in JNFS from its main stockholders, including the nine major Japanese electric utilities, Japan Atomic Power Company (JAPC), and 96 other industry-related companies. Virtually all of JNFS's 560 employees will be retained as part of JNFL.

The reprocessing division currently has two facilities in the early stages of construction. On May 6, JNFS broke ground on a new high-level radioactive waste management facility designed to store HLW in the form of vitrified solids produced as a result of spent fuel reprocessing. The building will store the wastes in canisters for an interim cooling period of 30 to 50 years; the wastes will then be moved to a permanent repository for final disposal. The interim storage facility, scheduled for completion in February 1995, will have a capacity of 1,440 canisters of vitrified solids (550 kg per canister). This new facility, when complete, will house the wastes generated from the reprocessing of Japanese spent fuel by BNFL and Cogema.

Construction of the Nuclear Fuel Development Center began on May 18, 1992, and is scheduled for completion in 1995. This facility is a reprocessing cold test and improvement facility located on the south side of the planned reprocessing plant. The development center will include testing and analytical laboratories, and will be completely equipped to simulate the planned reprocessing plant. The center will be used to test, develop, and refine the equipment and systems that will be used in the commercial reprocessing plant.

Together with the Power Reactor and Nuclear Fuel Development Corporation (PNC), which operates a pilot reprocessing plant at Tokaimura, the reprocessing division also will be responsible for the design, construction, and operation of an 800 metric ton-per-year reprocessing plant (**Figure 4**) estimated to cost ¥700 billion (US$5.5 billion). JNFS contracted in 1987 with Societé Generale pour les Techniques Nouvelles (SGN), a Cogema subsidiary, to provide the technology and engineering for the plant. The facility will be based primarily on technology used in Cogema's new UP3 reprocessing plant, but will use a BNFL nitric acid recovery process as well as German technology to remove iodine-129 from the chopping and dissolving operation. The permit for construction and operation of the reprocessing plant currently is under review by Japan's Nuclear Safety Commission, with commercial operation of the plant scheduled for late 1998.

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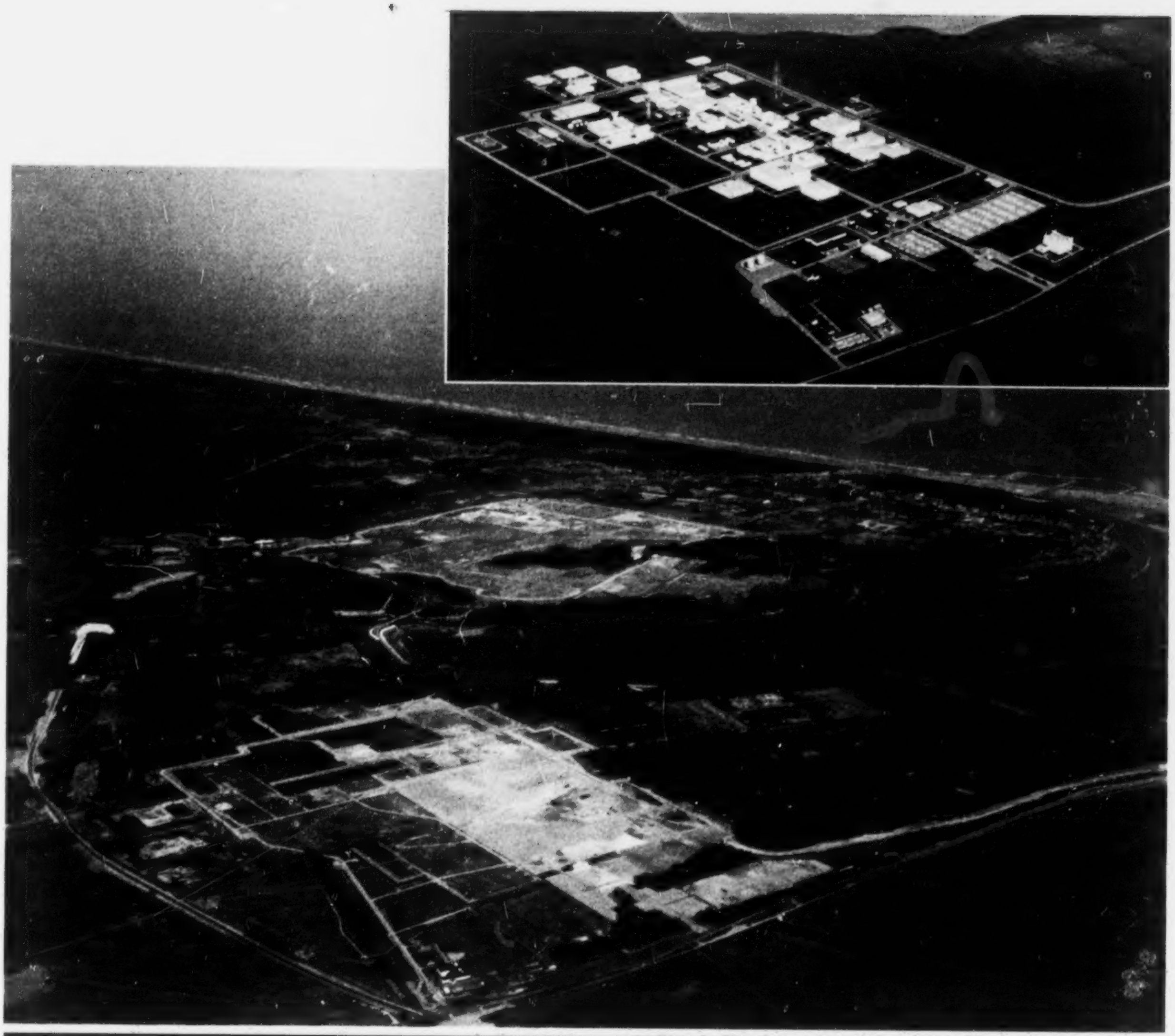

Figure 4 — JNFL Reprocessing Facilities. The main photo shows the reprocessing facilities in the early stages of construction. Note construction of the enrichment facilities on the far side of the Obuchi Marsh. The inset photo shows an artist's depiction of the completed reprocessing facility— completion is scheduled for 1998. *(Photo courtesy of JNFL)*

Uranium Enrichment and LLW Division (formerly JNFI)

The other half of the JNFL merger, Japan Nuclear Fuel Industries Company, Inc., was founded in March 1985 by the nine major electric utilities, JAPC (itself owned by the utilities), and numerous other companies in nuclear-related industries. (In total, 48 companies were owners prior to the merger). JNFI's four hundred employees handle two primary areas: uranium enrichment and low-level radioactive waste management.

In the enrichment area, Power Reactor and Nuclear Fuel Development Corporation was responsible for the national project of developing centrifugal separation enrichment technology. That project resulted in a 200 thousand SWU-per-year prototype enrichment plant operated by PNC at its Ningyo Toge complex since May 1989.

In 1985, PNC and JNFL signed a technical cooperation agreement, facilitating the transfer of the expertise and experience gained by PNC to the commercial centrifugal enrichment plant being built by JNFL. JNFL applied for an operation permit in May 1987, submitting a request to the Prime Minister to allow operation of a commercial enrichment plant with a final capacity of 1.5 million SWU per year (**Figure 5**). The initial request sought permission to operate the first phase of the plant with a 600 thousand SWU annual capacity. The permit request was examined by the Science and Technology Agency (STA), the Atomic Energy Commission, and the Nuclear Safety Commission, and permission was granted in August 1988; construction began two months later.

Construction proceeded smoothly toward the initial start-up capacity of 150 thousand SWU per year. Final STA inspection approval was received in May 1991, and the first uranium arrived at the plant near the end of September. After some delays due to voltage variation in the plant's power supply, the plant reached full-scale commercial operation on March 27, 1992. The full capacity of 1.5 million SWU annually will be reached by adding capacity in increments of 150 thousand SWU each year until the year 2000. The second increment, which will bring the current annual capacity to 300 thousand SWU, is completely installed and currently undergoing start-up testing; it is scheduled to enter commercial operation within a year. Presently, the entire plant has been shut down to resolve further problems in the electrical system, although the shutdown is expected to be brief. The plant uses a tails assay of 0.25 percent, and is licensed for a maximum enrichment level of 5.0 $^{w}/_{o}$ ^{235}U.

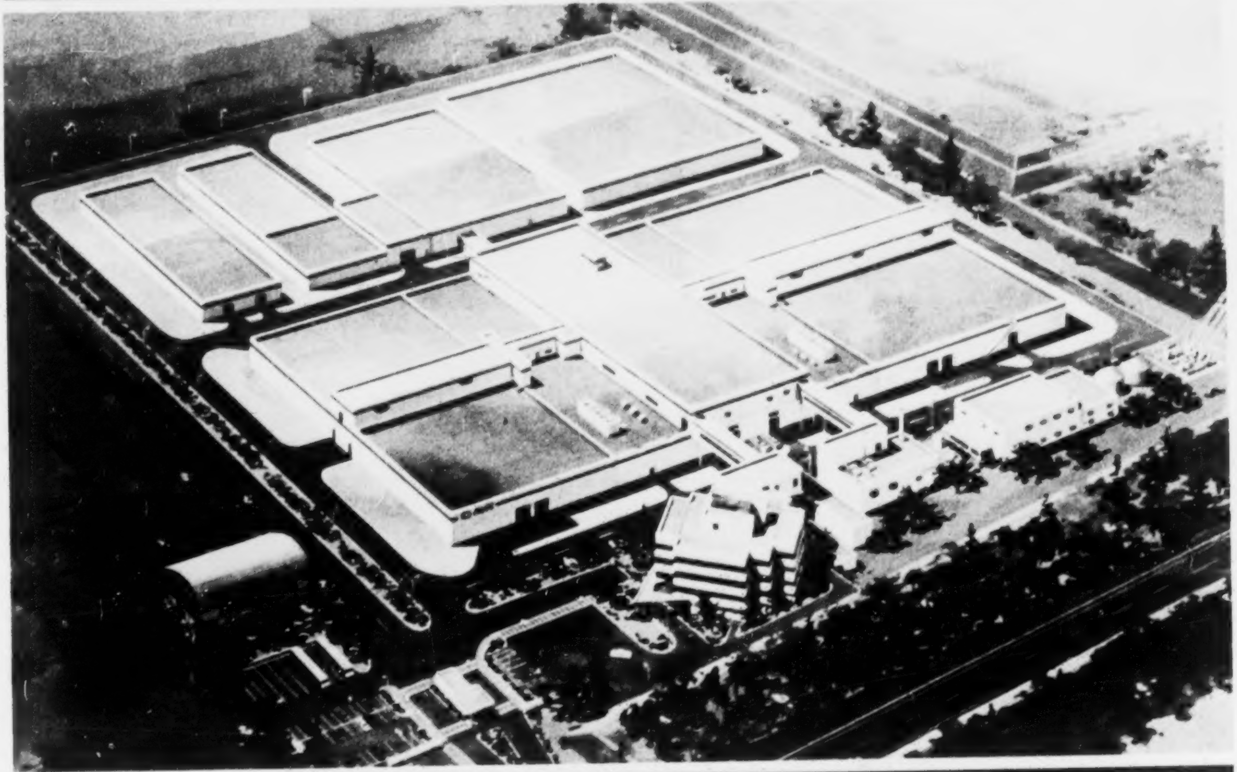

Figure 5 — JNFL's Centrifuge Enrichment Plant. An artist's rendering of the 1.5 million SWU-per-year facility, as it will appear when completed in 2000. The first stage of the plant, with a 150 thousand SWU-per-year capacity, went into commercial operation in March 1992. (*Photo courtesy of* JNFL)

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The initial operation permit of 600 thousand SWU will cover the first four capacity additions. In January 1992, JNFI submitted an operation change permit to add an additional 450 thousand SWU per year capacity for the plant, marking the start of the second phase of the plant's operation. For the remaining capacity additions, JNFI, in conjunction with PNC and the major utilities, was conducting research and development of new high performance materials for use in the centrifuge separators and will continue to do so as part of JNFL. Progress has been promising, and the use of the new materials to improve economic efficiency of the plant is expected in the final 450 thousand-SWU-capacity addition near the end of this decade.

Japan also has been planning to add a second, 1.5 million SWU-per-year plant, once the first plant is complete. This second enrichment facility is expected to use laser technology and to be built at Ningyo Toge. The process likely will be based upon PNC's Laser-J technology currently being developed at the Japan Atomic Energy Research Institute (JAERI).

The other primary area of responsibility of former JNFI business operations is low-level radioactive waste management. The company has begun construction of an LLW burial site at Rokkashomura, adjacent to the enrichment plant (**Figure 6**). Initial construction began in November 1990, and the first building cornerstone was laid on September 3, 1991. The initial operation permit allows burial of 200 thousand drums of waste, with a planned total capacity of one million drums. In addition to the standard permit procedure that requires STA approval and a second level of approval by the Atomic Energy Commission and Nuclear Safety Commission, public hearings also were conducted regarding the burial site and operation. The operation was fully approved and initial commercial operation of the LLW facility is planned for the end of this year.

CONCLUSION

Japan has made a strong commitment to nuclear power and an equally strong commitment to developing a supporting fuel cycle industry. The formation of JNFL is an important and positive step forward for the Japanese nuclear industry. Building on the mandate of support for the fuel cycle complex provided by the elections last year, the JNFI/JNFS merger and headquarters relocation to Aomori City will provide for better business operations, unite the company and the community, and improve the lines of communication to propel the development of the region to the benefit of the nuclear industry and the country as a whole.

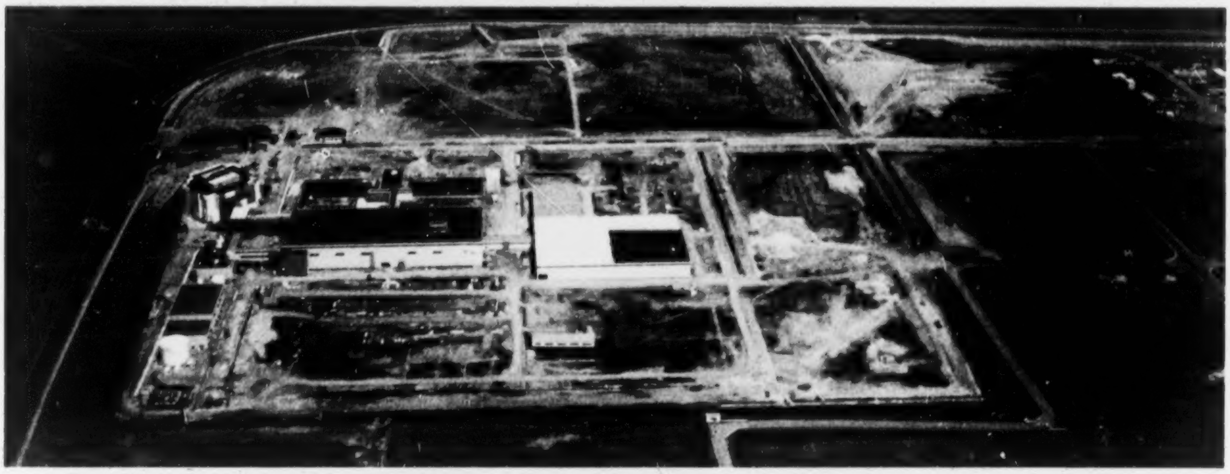

Figure 6 — JNFL Enrichment and LLW Storage Construction Site. Buildings to the left in the photo are the enrichment facilities. The LLW disposal site, to open initially late this year, is near the right hand edge. (*Photo courtesy of JNFL*)

URANIUM INDUSTRY UPDATE

Tough times for the uranium industry continued during the first half of 1992. In January, the Department of Energy announced its determination that the US uranium industry was non-viable in 1990, the seventh consecutive year for such a finding. Further, market analysts anticipate that the industry will again be found non-viable in 1991 and 1992. Spot uranium prices have remained near record-low levels, despite hopes that an affirmative finding on the anti-dumping petition filed by US interests against the former Soviet Union would boost the market. Several mines shut down or were permanently closed during the first six months of this year, exploration activity remains minimal, and the world uranium market remains vastly oversupplied. Moreover, there is a possibility this oversupply situation will be exacerbated by the millions of pounds of uranium and plutonium potentially available from the dismantlement of US and Soviet nuclear weapons.

Nevertheless, some uranium producers continue to survive by focusing on their most profitable operations. Industry consolidations have become a regular occurrence, and 1992 has been no exception, with several buyouts, mergers, joint-ventures, and other related events occurring again this year. World uranium production levels continue to shrink, and consumption remains well ahead of production. But the only way excess supply will be depleted is through inventory drawdown, eventually enabling a market price rise that will once again allow operators to produce uranium profitably.

WORLD PRODUCTION

Western World uranium production in 1992 has continued the steady decline evident over the past several years. Not including exports from China or the former COMECON nations, total 1992 uranium production may decrease by 15 percent, to approximately 55.5 million pounds equivalent U_3O_8.

Much of this decrease can be attributed to shutdown of production centers in North America: the open-pit mines at Shirley Basin and Rhode Ranch have been shut down; IMC has stopped its uranium by-product operations in Florida; processing at Denison's Elliot Lake facilities has come to a close; and the Rosita ISL project has halted production. In addition, production cuts have been made at facilities in Europe, Australia, and Africa. Although some projects have been closed due to economic ore depletion, the primary reason cited for the reduced production levels is low market prices. Large uranium stockpiles held by producers, utilities, and governments on virtually every continent continue to oversupply the market. Until this abundance of material is drawn down or otherwise designated, a substantial and sustainable price recovery is not possible.

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RAW MATERIALS

The most scrutinized event in 1992 has been the anti-dumping petition filed against the former Soviet Union by uranium producers with US operations. Speculation as to the outcome, the treatment of the former republics, the timing of the decision by the Department of Commerce (DOC), and the influence on the determination exerted by political and government events have all been widely iscussed.

On May 29, DOC issued a preliminary determination in the investigation. Based on data submitted by the petitioners and disregarding data submitted by the respondents—including Techsnabexport, Global Nuclear Services and Supply Ltd., and NUEXCO— DOC determined that the countries of Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Ukraine, and Uzbekistan had sold uranium in the USA at less than fair value, and accordingly, estimated a preliminary dumping margin of 115.82 percent. The Department found that the six other former republics had not produced, exported, or stockpiled any uranium and therefore were excused from the petition. A final determination is now scheduled for release by October 16.

Despite the complexity of the case—the suit was filed against the Soviet Union, a country that no longer exists—the finding of DOC was not unexpected. The only notable response to the investigation and to the preliminary determination has been the relative non-reaction by the market. Having learned expensive, and sometimes embarrassing, lessons in past attempts to anticipate price movements, market participants have watched recent events carefully and reacted cautiously. As a result, the fundamental oversupply situation has remained the dominant market influence, and prices have been relatively stable at their current low levels.

INDUSTRY CONSOLIDATIONS

Similar to 1991, several consolidations have highlighted uranium industry activity in 1992. The most significant, first announced in mid-January, involved the purchase by Cogema, the French fuel cycle conglomerate, of a majority share in Urangesellschaft mbH (UG) of Germany. The sale, finalized in early June, gives Cogema a 70-percent interest in UG. Preussenelektra AG (PREAG), a wholly owned subsidiary of the German energy corporation VEBA, will retain a 15-percent ownership share, and Steag AG, also controlled by VEBA, will own the other 15 percent.

With the UG purchase, Cogema acquired a number of uranium assets, including: an additional 6.5-percent interest in Niger's Somair project; an indirect interest in Kiggavik (a property in the Baker Lake region of the Northwest Territories, providing geographic balance to its Canadian uranium ownership interests, all currently located in Saskatchewan—Cigar Lake, Cluff Lake, and McArthur River); additional shares in Energy Resources of Australia; a five-percent share of the Rössing deposit in Namibia; and a 25-percent interest in PRI's Gas Hills, Wyoming project.

Cogema also assumes control of UG's 49-percent interest in Internexco, a uranium marketing joint-venture between UG and Techsnabexport of Russia. This relationship could give Cogema another source of supply, as well as improved access to the newly opened east European marketplace. Additionally, UG's trading and brokerage activities will complement the business of Interuran, a company 75-percent owned by Cogema. Interuran is a well-established European intermediary, and also owns 25 percent of the Highland uranium project in Wyoming.

In another key event in 1992, Denison Mines, Ltd. and Total Compagnie Minière reached an agreement to develop jointly their neighboring uranium deposits in the Athabasca Basin of Saskatchewan. The agreement outlines that Denison will receive C$25 million in cash, as well as a 22-percent share in Total's Wolly project (McClean Lake) and use of the planned mill. The Wolly project is owned by Minatco, a wholly owned subsidiary of Total. In return, Total, the French mining firm, will acquire 70 percent of Denison's share of the Koongarra deposit in Australia, and will have the right to 70 percent of Denison's share of production from the Midwest project. The Wolly and Midwest projects are only about ten miles apart in northern Saskatchewan. Mineable reserves from the Wolly project have been estimated to contain 45 million pounds U_3O_8 at an average grade of 3.71 w/o U_3O_8. Midwest reserves are projected to total 36 million pounds U_3O_8 at an average grade of 4.5 w/o U_3O_8. The agreements are subject to many conditions, including Australian and Canadian government approval, but represent a major step forward for Denison and Total, and will provide significant efficiencies by using one large mill once the deposits are developed.

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In June, Energy Fuels Exploration Company announced the formation of a Russian-American joint venture for the mining, processing, and marketing of uranium—the first uranium joint-venture ever concluded with an entity from the former Soviet Union. Participants in the tripartite agreement include Energy Fuels, the Priargunsky Gorno-Himichesky Kombinat (located in Krasnokamensk, Russia), and Techsnabexport of Russia. The Priargunsky Kombinat was the largest uranium producer of the former Soviet Union, its production derived from large underground mines in the Chita region in eastern Siberia.

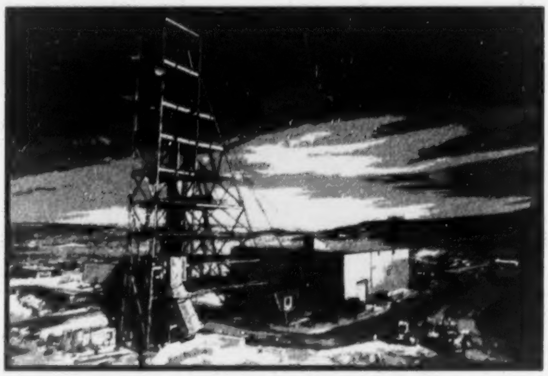
A few weeks earlier, Energy Fuels announced it had signed an agreement with Union Pacific Resources (UPR) to purchase UPR's Reno Creek uranium properties in the Powder River Basin of Wyoming. The acquisition is Energy Fuel's first in-situ leaching property; previously the company produced its uranium conventionally from high-grade breccia pipes in the Arizona Strip. Those mines are currently on standby; development drilling at the Arizona I mine ceased at the end of March.

The month of June had two other important announcements. Cameco Corporation of Saskatoon, Canada announced June 11 that it had purchased 100 percent of AGIP Resources, Ltd., a subsidiary of AGIP Minière S.p.A. of Italy, for C$49.75 million. AGIP Resources, which will be renamed Cameco Resources, Ltd., owns a ten-percent interest in the McArthur River uranium project, thereby effectively giving Cameco more than a 56-percent ownership share in the project. The purchase further solidifies Cameco's position as a leader in the uranium industry and also fits AGIP's strategy of exiting the uranium and precious metals sector.

On June 8, RTZ Corporation of the UK announced that it was selling its 51.5 percent interest in Rio Algom, Ltd., the Canadian mining firm. The sale of the 22.5 million common shares was underwritten by ten Canadian securities firms and was valued at C$362.3 million. RTZ cited potential conflict of interest concerns as the reason for the sale, as RTZ also owns 100 percent of Kennecott Corporation, another North American company with uranium mining interests.

Among its uranium interests, Kennecott is a partner with US Energy Corporation and its subsidiary, Crested Corporation, in the Green Mountain Mining Venture. The Green Mountain partners recently finalized their acquisition of the Sweetwater uranium mill in Wyoming from Unocal Corporation, a transaction that had been under negotiation for more than a year. The joint-venture partners will assume most of the environmental liabilities, estimated at $16.3 million, at the twelve-year-old mill. The acquisition will enable the joint-venture to use the existing mill to process ore from its nearby Green Mountain deposits, once mining begins.

One other potential industry-related buyout was notable, although a sale never took place. Geomex/Imperial Metals made it known early in the year that its 60-percent equity interest in the Crow Butte ISL project in Nebraska was for sale. The controlling interest was available for $45 million, but no buyers accepted. In June, Geomex/Imperial removed its offer to sell the interest, stating it was recommitted to production from Crow Butte. Production is expected to total approximately 400 thousand pounds U_3O_8 in 1992.



PRODUCTION CENTER CLOSURES

For the past several years, shutdowns and closures of uranium production facilities have become a common occurrence. In 1992, due to depleted reserves or low market prices, many production centers have ceased operations.

Two of the most notable closures were the cessation of mining operations at Rhode Ranch, Texas, and Shirley Basin, Wyoming. These facilities were the last two open-pit uranium mines in the USA. General Atomics subsidiary Rio Grande Resources, operated the Rhode Ranch mine through the end of 1991, but closed it permanently January 1, 1992, to begin full reclamation. Pathfinder Mines removed the final load of ore from the Shirley Basin

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open pit on March 25, and the last of the feed was processed at the mill on May 17. Pathfinder has begun reclamation of that site, as well as reclamation of its Gas Hills properties and dismantlement of its Lucky Mc mill.

Another major closure announcement was made by IMC Fertilizer on July 1. IMC stated it was shutting down its uranium by-product operations at its New Wales and Plant City phosphate chemical facilities until a market turnaround. The company had been producing at a rate of nearly two million pounds U_3O_8 per year, making it the largest US uranium producer prior to the shutdowns.

On April 1, Uranium Resources, Inc. (URI) discontinued production at its Rosita ISL project in south Texas. URI began production at Rosita in September 1990, and after some initial bacterial problems, was producing at an approximate rate of 750 thousand pounds U_3O_8 annually. Due to the depressed uranium market, URI made a decision in mid-1991 not to develop a second well field. The project had proven reserves of 6.2 million pounds equivalent U_3O_8 originally, and production restart is planned when market conditions improve. In the meantime, URI is conducting groundwater sweeping at a rate of 100 gpm to clean up the developed well fields.

Another closure in 1992 was the final shutdown of Denison Mines' Elliot Lake project. The last load of ore was removed in March and final cleanup is underway. Decommissioning plans are being prepared for submittal to Canadian regulatory agencies.

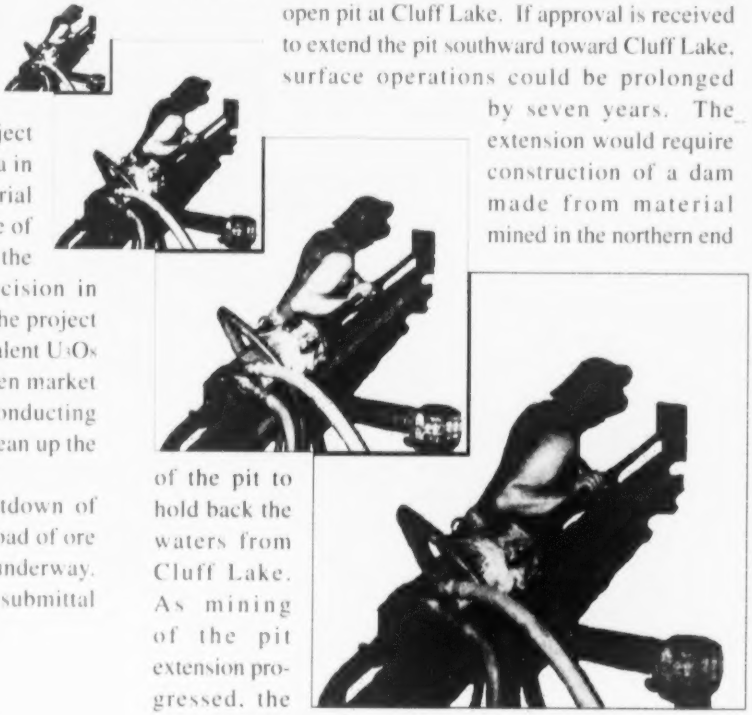
ACTIVE URANIUM OPERATIONS

Canada

Canada is maintaining its position as the world's preeminent uranium producer, with the largest and highest ore grade deposits in the world. Canada's 1992 production should exceed 20 million pounds equivalent U_3O_8, more than one-third of total Western World production.

Despite depressed market prices, exploration and development remains fairly active. Drilling activity reached as high as 19 rigs in March, the end of the Canadian winter drilling season. Cameco reported several development rigs in operation at McArthur River; Amok, Cameco, Cigar Lake Mining Corp., and Rio Algom all reported drilling operations, primarily underground rigs, at their respective properties. Minatco, PNC, and UG also reported that they had conducted development drilling.

The joint federal-provincial environmental assessment panel formed in 1991 to review all Saskatchewan uranium development plans began addressing several issues this year. In March 1992, the panel released for a 90-day public review the plans for the extension of the Dominique-Janine open pit at Cluff Lake. If approval is received to extend the pit southward toward Cluff Lake, surface operations could be prolonged by seven years. The extension would require construction of a dam made from material mined in the northern end of the pit to hold back the waters from Cluff Lake. As mining of the pit extension progressed, the waste rock would be disposed of on the lake side of the dam to build additional strength.



The federal-provincial panel also announced that it was still evaluating the environmental impact statements (EIS) of McClean Lake (Wolly Project) and the Midwest joint venture. The panel is evaluating the results of studies it had commissioned a private company to conduct on the EIS's. The findings of the studies, along with comments received from other review participants, are being assessed to determine if any additional information is required before public hearings are held regarding the two projects.

On June 1, the panel released its draft guidelines and government information requirements for the EIS from the Cigar Lake and McArthur River projects. The draft guidelines were open to public comment until early July. Final guidelines will be issued later this autumn.

USA

The US uranium industry continues to shrink. US production may reach only 5.4 million pounds U_3O_8 in 1992, roughly a 31-percent decrease from 1991's level of 7.9 million pounds. The large production decline is due to the shutdown and closures at Rhode Ranch, Shirley Basin, Rosita, New Wales, and Plant City. Nevertheless, several operations are continuing to produce uranium, and some exploration and development activity is on-going. US drilling activity peaked at 26 rigs in June: twelve were production rigs and 14 were exploratory rigs. No underground rigs were operating, further indicating the absence of conventional mining in the USA.

The largest operating US uranium producer is Freeport Uranium Recovery, Inc. Freeport's uranium by-product operations from phosphate production at Donaldsonville and Uncle Sam are projected to produce 1.1 million pounds U_3O_8 in 1992. The Highland uranium project, operated by Power Resources, Inc. (75 percent owned by PRI and 25 percent by Interuran), is expected to produce about 900 thousand pounds U_3O_8 this year, making it the largest remaining solution mining facility in the USA. Total Minerals' ISL facilities at El Mesquite, Texas and Christensen Ranch, Wyoming were restarted in 1991 and each is producing at a rate of 200 thousand pounds U_3O_8 annually. Other operating uranium production centers in the USA include Ferret's Crow Butte, and Rio Algom's Ambrosia Lake mine-water recovery operations.

Australia

Restrictive government policies, as well as depressed prices, remain major factors limiting uranium production and development in Australia. Olympic Dam is one of only two operating Australian producers. The company completed an expansion of its facilities during the first quarter of this year, boosting production capability by approximately 16 percent, to 3.1 million pounds U_3O_8 per year.

Energy Resources of Australia (ERA) is the other Australian operator, producing more than six million pounds U_3O_8 annually during the past few years from its Ranger open-pit operation. However, market conditions have led ERA to cut production nearly in half using a novel means to implement the cutback. The company will use a reduced member of employees to mine ore for half a year, then those same employees will process the ore at the mill the other half of the year.

Under the government's so-called three-mine policy, uranium exploration has been minimal in recent years. However, for the first time in twenty years, three companies have received permission to explore in the Arnhem Land region in Northern Australia. The potential of this mineral-rich area is immense, but has effectively been off-limits to exploration for some years. Noble Resources of Australia recently purchased Uranerz Australia, Ltd. from Rheinbraun AG and PREAG of Germany for A$2.3 million. Using the exploration rights conveyed by the purchase, Noble has negotiated access rights in Arnhem Land; Queensland Mines and Japan's Power Reactor and Nuclear Development Corporation (PNC) are the only other companies with access rights. Expectations are high that substantial, new deposits of uranium and other base metals will be found in this region of the country that yielded the now-depleted Nabarlek deposit.

South Africa

Production levels in South Africa have decreased significantly for the ninth consecutive year. Only three companies of the ten members of the country's Chamber of Mines continue to produce uranium: the Vaal Reefs project, Western Areas, and Hartebeestfontein, along with non-member Palabora Mining Company. Total South African production during the first half of 1992 equalled only two million pounds U_3O_8; if this rate is duplicated in the second half of the year, it would represent approximately a four percent decrease from 1991's production total of 4.3 million pounds U_3O_8. Gengold's Buffelsfontein mine ceased uranium production near the end of 1991 and accounts for the majority of the decrease in output.

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France

Cogema remains the primary uranium supplier to Electricité de France, and as illustrated by its purchase of UG, continues to expand its access to diversified reserves. The company is planning to close its mining division in the Limoges region, but has expanded the activities of its Herault division. That division's Lodeve mine still has 18 million pounds U_3O_8 of reserves, enabling the mine to continue production through 1999. The Herault division also opened a new mine in February near Montpellier in southern France, and is considering two other new mines. Cogema has indicated that this region has the highest quality uranium in the country and is continuing exploration efforts in the area.

CONCLUSION

Depressed market prices caused by liquidation of excess producer, utility, and government stockpiles continue to determine the near-term fate of the world's uranium industry. While total consumption over the past five years is nearly twice that of worldwide production, uranium supplies still overwhelm demand. It will be several more years before inventories are reduced enough to warrant a sustainable price increase. Meanwhile, even low-cost uranium producers have been forced into lean and efficient operation, and often have consolidated with other companies to improve efficiencies further. When prices do recover, these surviving producers will be well-positioned to profit from the inevitable market upturn.

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NUCLEAR INDUSTRY CALENDAR

1992	
Sept. 9-11	***Uranium Institute 17th Annual Symposium*** (London, United Kingdom). Contact: 44-71-225-0303; Fax: 44-71-225-0308.
Sept. 20-23	***International Uranium Seminar '92*** (Hyatt Regency Hotel, Lake Tahoe, Nevada). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office: 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 20-25	***World Energy Council 15th Congress*** (Madrid, Spain). Contact: WEC Organizing Committee; 34-1-255-7204; Fax: 34-1-246-3540.
Sept. 21-23	***2nd International Conference on Training for Operation & Maintenance in the Nuclear Industry*** (The Moat House International Hotel, Stratford-upon-Avon, United Kingdom). Sponsored by the Institution of Nuclear Engineers. Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.
Sept. 29- Oct. 1	***Crisis/Emergency Information Planners' Workshop*** (Loews L'Enfant Plaza, Washington DC) Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office: 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Oct. 2-4	***IAEA/NEA International Seminar on Decommissioning Policies*** (Paris, France). Sponsored by the International Atomic Energy Agency and the OECD Nuclear Energy Agency. Contact: IAEA Conference Service Section, P. O. Box 100, A-1400 Vienna, Austria.
Oct. 18-22	***AMC Mining Convention*** (Las Vegas, Nevada). Sponsored by the American Mining Congress. Contact: AMC Convention Office; 202-861-2800; Fax: 202-861-7535.
Oct. 19-23	***International Symposium on Geological Disposal of Spent Fuel, High-level and Alpha-bearing Wastes*** (Antwerp, Belgium). Sponsored by the International Atomic Energy Agency. Contact: IAEA Conference Service Section, P. O. Box 100, A-1400 Vienna, Austria.
Nov. 15-18	***International Nuclear Energy Forum*** (Fairmont Hotel, Chicago, Illinois). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office: 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Nov. 15-20	***American Nuclear Society Winter Meeting*** (McCormick Center Hotel, Chicago, Illinois). Contact: ANS Meetings Department; 708-352-6611.

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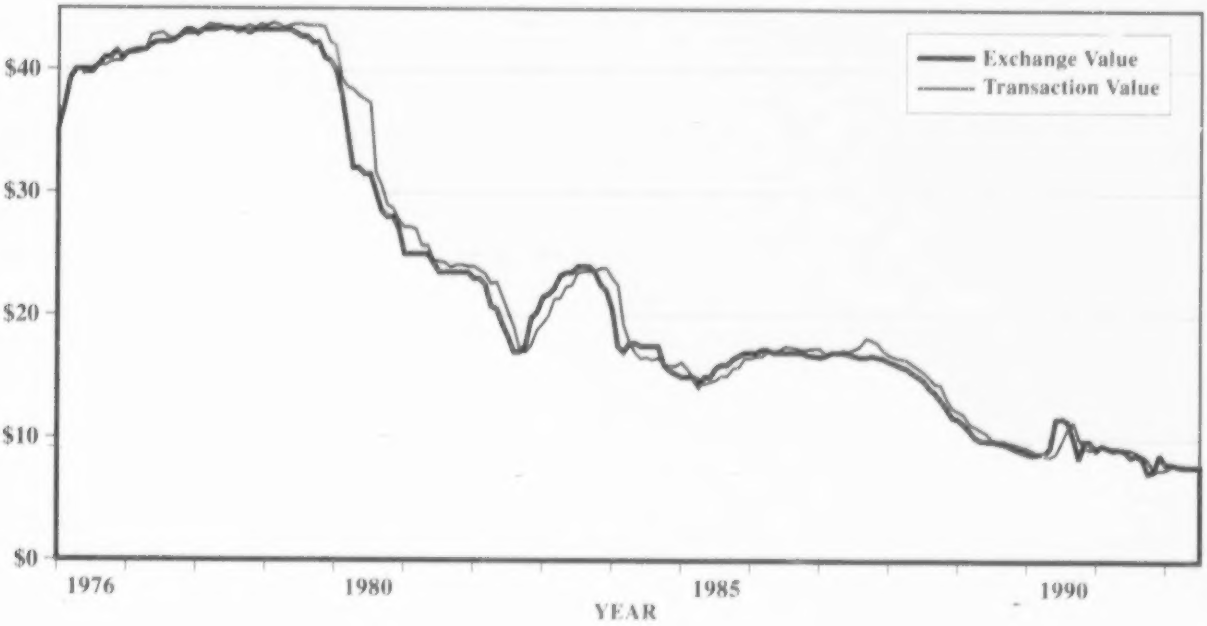
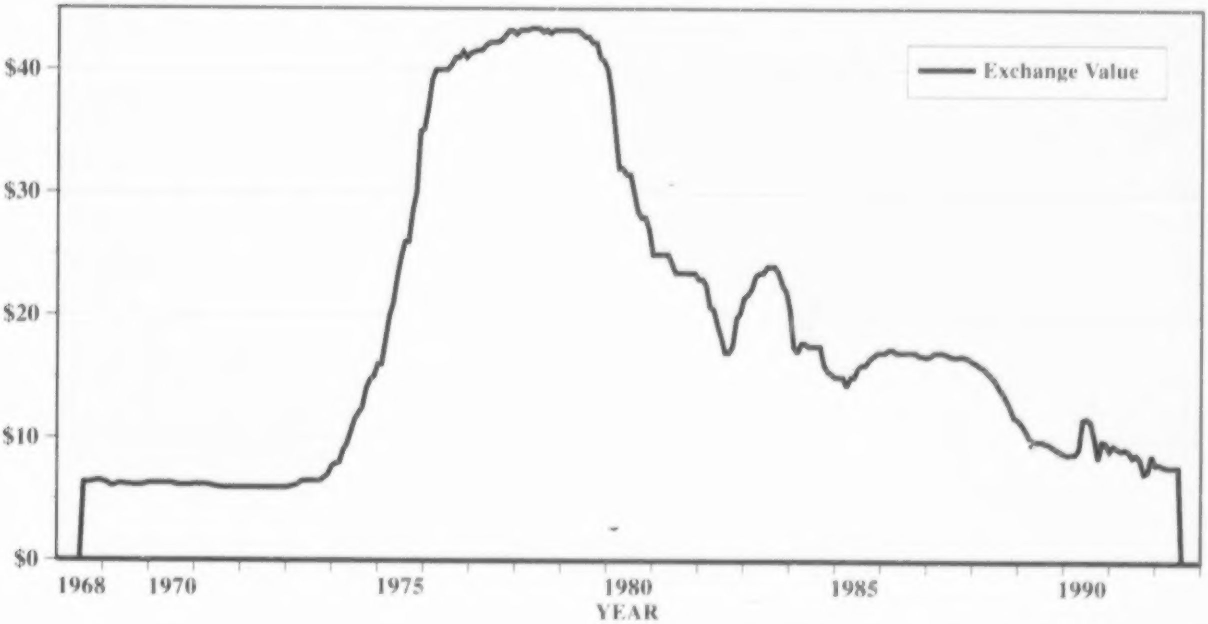
NUEXCO HISTORICAL EXCHANGE VALUE AND TRANSACTION VALUE

(in US dollars per pound U_3O_8)





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HISTORICAL MARKET VALUES

Exchange Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	9.80	9.70
1991	9.10	9.50	9.30	9.10	9.20	9.05	8.55	8.75	8.40	7.25	7.40	8.75
1992	8.00	8.00	7.85	7.75	7.75	7.75	**7.75**					

US Premium (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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HISTORICAL MARKET DATA

UF₆ Values

Determined as of the last day of the month indicated ($US/kg U as UF₆)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29.50	24.75	28.75	28.75
1991	27.50	27.75	27.50	27.25	27.60	27.25	25.75	26.25	25.50	22.75	22.75	26.00
1992	24.50	24.25	24.00	23.75	23.60	23.60	**23.50**					

US Premium (Relative to the UF₆ Value)

Determined as of the last day of the month indicated ($US/kg U as UF₆)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

Conversion Values

Determined as of the last day of the month indicated ($US/lb U as UF₆)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
1991	1.45	1.45	1.45	1.45	1.50	1.50	1.50	1.60	1.55	1.55	1.55	1.55
1992	1.60	1.60	1.60	1.60	1.60	1.50	**1.50**					

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Transaction Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	9.30	9.15
1991	9.40	9.45	9.35	9.30	9.30	9.20	9.15	8.95	8.70	8.35	7.45	7.50
1992	7.55	7.80	7.95	7.90	7.85	7.80	**7.75**					

SWU Values

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	51	51
1991	51	50	52	52	54	59	66	67	67	68	68	70
1992	71	70	69	67	65	65	**66**					

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Loan Rates

	Determined as of the last day of the month indicated (Percent per Annum)											
Year	**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1991	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.00
1992	3.00	3.00	3.00	3.00	3.00	3.00	**3.00**					

* Float with Prime Rate

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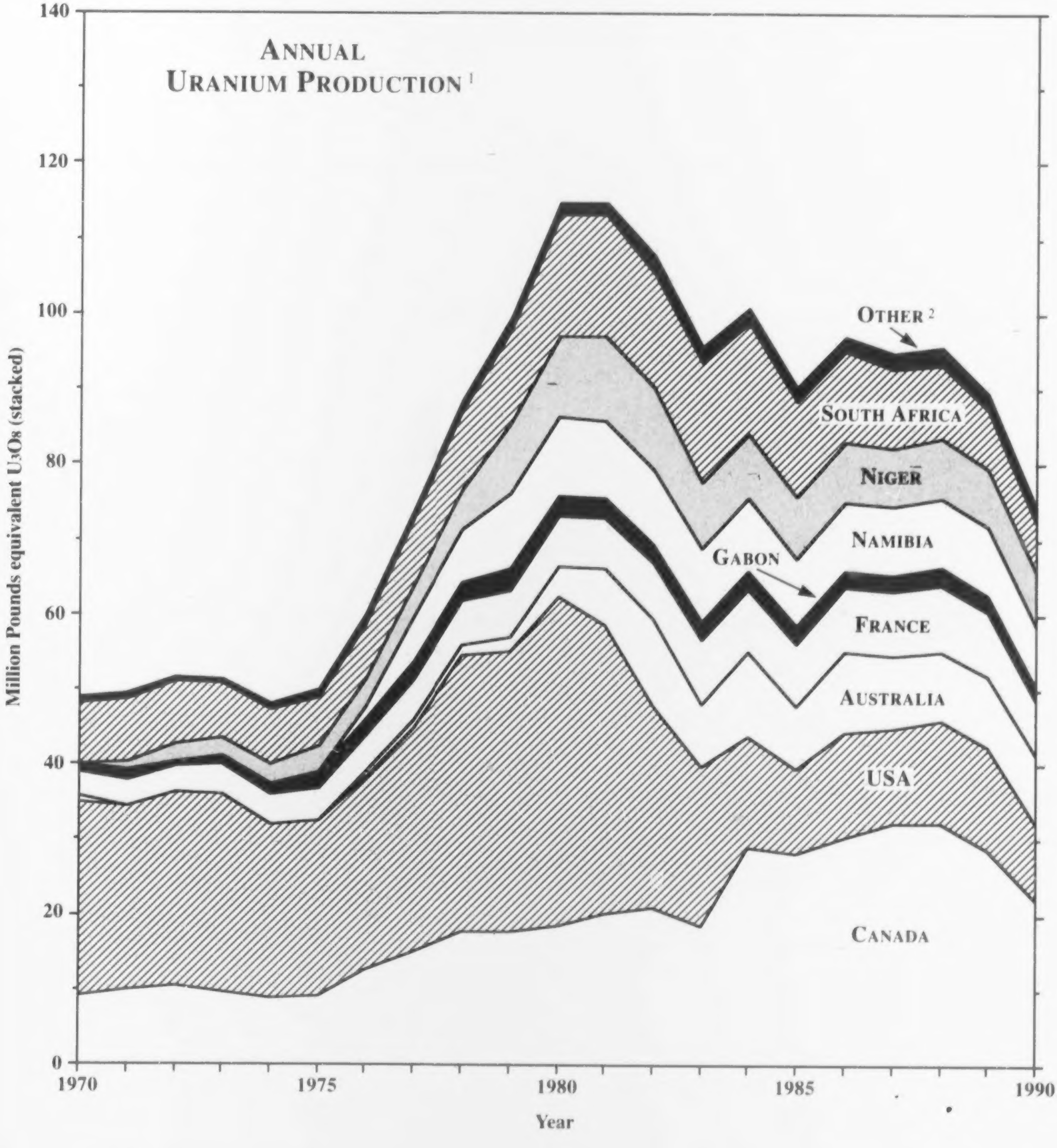
HISTORICAL MARKET DATA



[1] Estimated western world uranium production in 1990 totalled 74.5 million pounds equivalent U_3O_8 — (Australia: 9.1 – Canada: 22.0 – France: 7.4 – Gabon: 1.8 – Namibia: 8.0 – Niger: 7.4 – South Africa: 6.4 – USA: 10.2 – Other[2]: 2.2)

[2] **Other** includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, former West Germany, and Yugoslavia (Slovenia)

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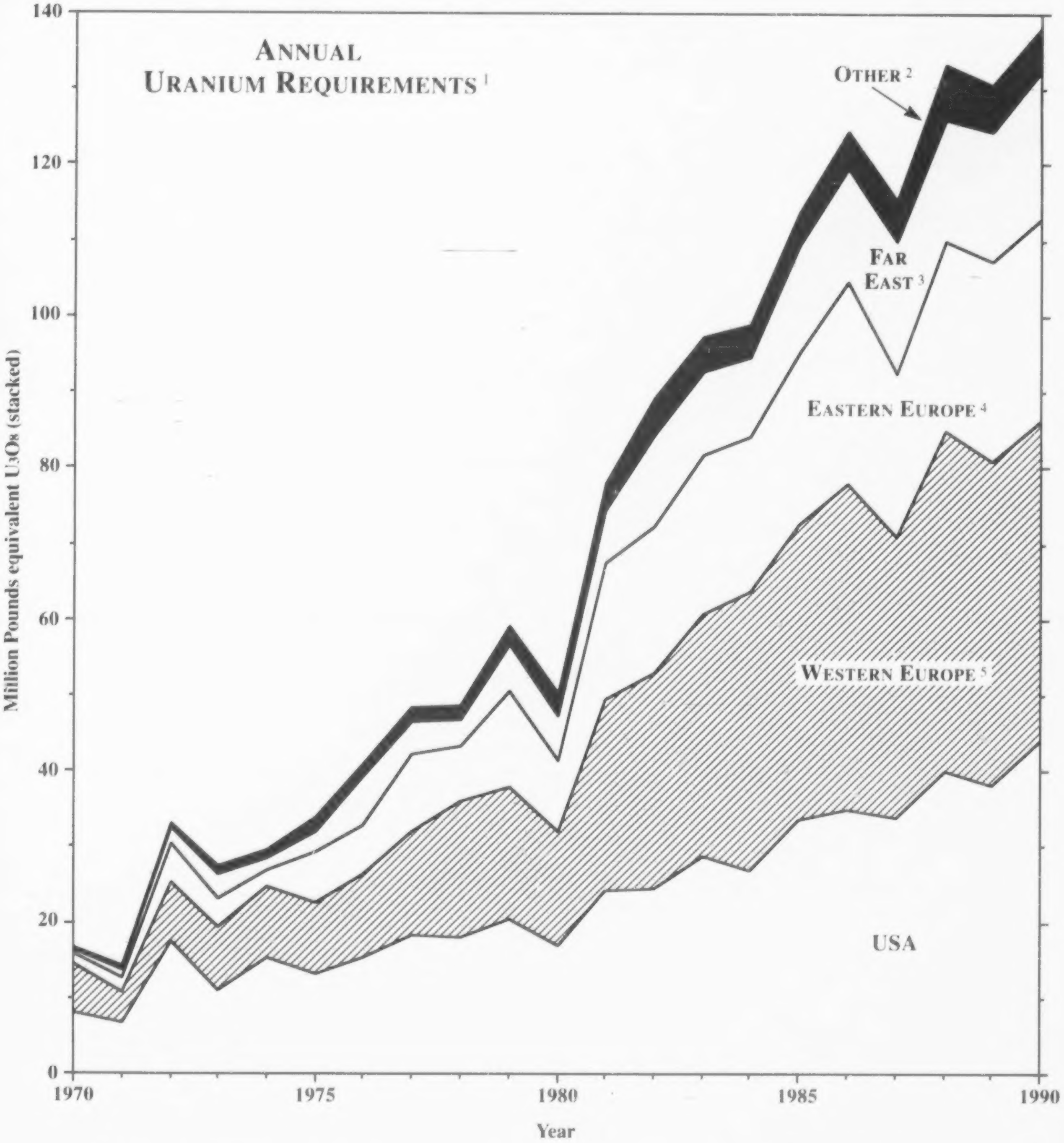

[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assay.

[2] **Other** includes: Argentina, Brazil, Canada, India, Mexico, Pakistan, and South Africa.

[3] **Far East** includes: Japan, People's Republic of China, South Korea, and Taiwan.

[4] **Eastern Europe** includes: Bulgaria, Czechoslovakia, former East Germany, Finland, Hungary, former Soviet Union, and Yugoslavia (Slovenia).

[5] **Western Europe** includes: Belgium, France, former West Germany, Italy, The Netherlands, Spain, Sweden, Switzerland, and UK.

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Australia

Year	Period[1]	Consumer Price Index[2] (1989/1990 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia[5] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[4] (June 1985 = 100)
1980	Avg.	47.4	83.1	—	69.6
1981	Avg.	51.9	85.9	—	76.1
1982	Avg.	57.7	89.0	—	86.4
1983	Avg.	56.9	96.9	—	89.9
1984	Avg.	66.0	98.0	—	96.0
1985	Avg.	70.5	107.3	—	100.0
1986	Avg.	76.9	101.5	—	104.9
1987	Avg.	83.4	108.9	465.88	112.9
1988	Avg.	89.4	111.8	496.90	115.4
1989	Avg.	96.2	117.0	534.65	126.0
1990	Avg.	103.2	123.4	571.43	129.7
1991	Avg.	106.5	120.1	600.35	133.7
Jan	1991	—	125.6	—	133.0
Feb	1991	—	121.5	597.70	133.0
Mar	1991	105.8	119.1	—	133.3
Apr	1991	—	117.6	—	133.3
May	1991	—	117.8	592.00	133.4
June	1991	106.0	120.4	—	133.4
July	1991	—	120.4	—	133.4
Aug	1991	—	119.9	599.50	133.8
Sept	1991	106.6	118.3	—	134.2
Oct	1991	—	118.7	—	134.3
Nov	1991	—	120.6	612.20	134.4
Dec	1991	107.6	121.2	—	134.5
Jan	1992	—	120.9	—	134.7
Feb	1992	—	120.9	625.20	134.7
Mar	1992	107.6	120.0	—	134.8
Apr	1992	—	120.5	—	134.8
May	1992	—	122.4	—	—

P = Preliminary **R** = Revised since last month

[1] Monthly data for the period 1967 to 1990 appears in NUEXCO Monthly Report 278.

[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1989 to June 1990 = 100.0). Figures shown at end of quarter represent quarterly average. Base year changed from 1980/81 in Monthly Report 286.

[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (CATALOGUE No. 6411.0).

[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (CATALOGUE No. 6312.0). Figures for the latest fourteen months shown are subject to revision.

[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (CATALOGUE No. 6302.0).

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Canada

				Wage-earner Data: Average Hourly Earnings (C$)[4]				
Year	Period	Industrial Products Price Index: All Commodities[1] (1986 = 100)[2]	Consumer Price Index: All Items (1986 = 100)[3]	Uranium Mines (SIC 057)	Metal Mines (SIC 061)	Mines, Quarries and Oil Wells (SIC 061-092)	Metal Rolling, Casting and Extruding (SIC 299)	Chemicals and Chemical Products Industries (SIC 371-379)
1980	Avg.	75.9	67.2	—.—	—.—	—.—	—.—	—.—
1981	Avg.	83.6	75.5	—.—	—.—	—.—	—.—	—.—
1982	Avg.	89.0	83.7	—.—	—.—	—.—	—.—	—.—
1983	Avg.	92.1	88.5	17.22	15.27 **R**	14.58	10.17	11.03
1984	Avg.	96.3	92.4	17.89	16.25 **R**	15.29	10.59	11.67
1985	Avg.	99.0	96.0	18.53	16.73 **R**	15.83	11.54	12.14
1986	Avg.	100.0	100.0	19.38	16.88 **R**	15.98	12.20	12.65
1987	Avg.	102.8	104.4	20.12	17.16 **R**	16.25	13.04	13.22
1988	Avg.	107.2	108.6	20.91	18.60 **R**	17.22	13.58	13.72
1989	Avg.	109.4	114.0	21.97	19.60 **R**	18.37	14.02	14.31
1990	Avg.	109.7	119.4	22.90	20.53 **R**	19.11	14.88	15.13
1991	Avg.	108.6	126.2	24.35	22.44 **R**	20.59	14.94	16.22
Jan	1991	111.1	125.0	23.79	21.53 **R**	19.94	14.86	15.51
Feb	1991	110.6	125.0	25.23	22.32 **R**	20.39	14.82	15.84
Mar	1991	109.8	125.5	24.19	22.17 **R**	20.57	15.50	16.19
Apr	1991	109.1	125.5	24.77	22.20 **R**	20.57	14.76	16.28
May	1991	108.6	126.1	24.38	21.86 **R**	20.51	15.04	16.26
June	1991	108.5	126.7	23.58	21.96 **R**	20.10	14.67	16.25
July	1991	108.2	126.8	24.70	22.52 **R**	20.17	14.52	16.07
Aug	1991	107.8	126.9	23.78	24.42 **R**	20.96	14.72	16.01
Sept	1991	107.6	126.7	24.23	22.43 **R**	20.61	14.95	16.40
Oct	1991	107.3	126.5	24.40	22.42 **R**	20.80	15.13	16.43
Nov	1991	107.3	127.0	24.58	22.68 **R**	21.05	15.00	16.46
Dec	1991	107.2	126.4	24.53	22.80 **R**	21.39	15.30	16.92
Jan	1992	107.2	127.0	24.79	22.78 **R**	21.48	15.78	16.91
Feb	1992	108.1 **R**	127.1	24.42	22.60 **R**	21.41	16.18	16.82
Mar	1992	108.2	127.5	24.92	22.92 **R**	21.37	16.31	16.62
Apr	1992	108.1 **R**	127.6	**[5]	23.39 **R**	22.04 **R**	16.60 **R**	16.69 **R**
May	1992	108.7 **R**	127.8	**	23.36 **P**	21.53 **P**	16.44 **P**	16.79 **P**
June	1992	108.7	128.1	**	—.—	—.—	—.—	—.—

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (CATALOGUE 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1990 is found in NUEXCO Monthly Report 278.

[2] New Base Year of 1986 as of NUEXCO Monthly Report 266. Previous Base Year was 1981.

[3] New Base Year of 1986 as of NUEXCO Monthly Report 264. Previous Base Year was 1981.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1990 is found in NUEXCO Monthly Report 278. SIC number revisions shown starting in Monthly Report 287.

[5] As of April 1992, Statistics Canada no longer provides specific information on uranium mine wages. The data has been included with Metal Mines (SIC 061).

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South Africa

Year	Period	Average Declared Working Costs per Metric Ton of Gold Ore Milled[1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled[2] (March 1982 = 100)	Consumer Price Index[3] (1990 = 100)	Production Price Index All Groups[4] (1990 = 100)	Total Employment in Mining and Quarrying[5]	Total Salaries and Wages in Mining and Quarrying[5] (1,000 Rand)
							Annual Total[6]
1980	Avg.	35.50	—	25.5	27.7	709,042	2,237,689
1981	Avg.	41.87	—	29.4	31.5	722,918	2,756,928
1982	Avg.	47.23	103.9	33.7	35.9	702,041	3,181,584
1983	Avg.	51.88	115.0	37.8	39.7	700,901	3,563,282
1984	Avg.	58.95	130.3	42.2	43.0	711,511	4,134,390
1985	Avg.	68.70	151.7	49.1	50.3	724,587	4,778,612
1986	Avg.	80.18	177.9	58.2	60.1	756,637	5,767,950
1987	Avg.	95.01	223.1	67.6	68.5	751,864	6,911,395
1988	Avg.	106.69	241.1	76.2	77.5	705,355	7,774,054
1989	Avg.	116.65	273.0	87.4	89.3	700,360	8,833,934
1990	Avg.	129.37	305.3	100.0	100.0	677,742	10,193,209
1991	Avg.	136.06	322.4	115.1	111.4	630,722	10,934,073
							Monthly Total
Jan	1991	—	—	107.7	108.6	648,944	935,839
Feb	1991	—	—	109.0	109.0	650,948	893,373
Mar	1991	137.66	323.82	110.0	108.2	651,843	924,930
Apr	1991	—	—	111.5	108.8	639,939	887,722
May	1991	—	—	113.2	109.8	630,481	887,107
June	1991	134.65	317.23	114.0	110.3	640,908	890,595
July	1991	—	—	115.5	111.2	637,581	881,182
Aug	1991	—	—	117.1	112.0	633,699	963,710
Sept	1991	137.11	329.05	118.7	113.2	639,535	1,014,424
Oct	1991	—	—	119.8	114.8	584,435	860,529
Nov	1991	—	—	120.9	115.3	602,461	853,864
Dec	1991	134.81	319.33	123.8	115.8	602,486	940,798
Jan	1992	—	—	125.1	115.9	622,143	953,440
Feb	1992	—	—	126.2	116.3	618,114	925,858
Mar	1992	139.69	331.46	127.3	116.9	620,767	954,626
Apr	1992	—	—	128.9	118.4	—	—
May	1992	—	—	129.9	119.4	—	—
June	1992	140.69	334.63	131.2	—	—	—

P = Preliminary **R** = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in NUEXCO Monthly Report 278.

[2] Page 16 of Report 178 contains description and calculation of index.

[3] Central Statistical Service, Pretoria: All income groups-weighted average. Historical Data by month appears in NUEXCO Monthly Report 278.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa. Base Year changed from 1985 to 1990 in NUEXCO Monthly Report 284.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in NUEXCO Monthly Report 236.

[6] Annual total is shown, rather than monthly average, for indicated year.

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United States

		Producer Price Index[1]			GNP	GDP	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
Year	Period	Industrial Commodities (1982 = 100)	All Commodities (1982 = 100)	Consumer Price Index[2] (1982-84 = 100)	Implicit Price Deflator[3] (1987 = 100)	Implicit Price Deflator[3] (1987 = 100)	Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
1980	Avg.	88.0	89.8	82.4	71.7	71.7	10.26	10.63	8.31	6.94
1981	Avg.	97.4	98.0	90.9	78.9	78.9	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	83.8	83.8	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	87.2	87.2	12.58	13.43	10.58	8.66
1984	Avg.	103.3	103.7	103.9	91.1 **R**	91.0	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	94.4	94.4	13.38	13.74	11.57	9.46
1986	Avg.	100.0	100.2	109.6	96.9	96.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	100.0	100.0	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	103.9	103.9	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	108.5 **R**	108.5	13.59	13.72	13.09	10.05
1990	Avg.	115.8	116.3	130.7	113.2 **R**	113.2	14.10	14.36	13.54	10.32
1991	Avg.	116.5	116.5	136.2	117.8 **R**	117.8	14.89	14.64	14.07	10.73
Jan	1991	119.3	119.0	134.6	—	—	14.73	14.63	13.85	10.60
Feb	1991	117.2	117.2	134.8	—	—	14.80	14.55	13.81	10.59
Mar	1991	115.6	116.1	135.0	116.4 **R**	116.5	14.93	14.55	13.85	10.55
Apr	1991	115.6	116.0	135.2	—	—	14.85	14.56	13.96	10.63
May	1991	116.1	116.5	135.6	—	—	14.79	14.52	14.01	10.66
June	1991	116.1	116.4	136.0	117.4 **R**	117.5	14.88	14.51	14.05	10.74
July	1991	116.0	116.1	136.2	—	—	15.09	14.56	14.16	10.77
Aug	1991	116.3	116.2	136.6	—	—	14.82	14.64	14.06	10.78
Sept	1991	116.3	116.1	137.2	118.2 **R**	118.2	15.04	14.59	14.21	10.84
Oct	1991	116.7	116.4	137.4	—	—	14.94	14.75	14.25	10.78
Nov	1991	116.7	116.4	137.8	—	—	15.29	14.89	14.27	10.88
Dec	1991	116.1	115.9	137.9	118.9 **R**	118.9	15.13	14.87	14.34	10.96
Jan	1992	115.7	115.6	138.1	—	—	15.06	14.74	14.30	10.90
Feb	1992	116.0	116.0 **R**	138.6	—	—	15.22	14.67	14.29	10.90
Mar	1992	115.9	116.1	139.3	119.8 **R**	119.8	15.05	14.57	14.26	10.92
Apr	1992	116.3	116.3	139.5	—	—	15.02 **R**	14.61 **R**	14.39	10.98 **R**
May	1992	117.2	117.1	139.7	—	—	15.10 **P**	14.77 **P**	14.40 **R**	11.00 **R**
June	1992	118.0	117.8	140.2	—	120.5	—.—	—.—	14.41 **P**	11.06 **P**

P = Preliminary **R** = Revised since last month

[1] US Bureau of Labor Statistics, Washington, DC: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents Historical data is presented in NUEXCO Monthly Report 278.

[2] US Bureau of Labor Statistics, Washington, DC: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in NUEXCO Monthly Report 278.

[3] US Department of Commerce, Washington, DC: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The Gross National Product (GNP) and Gross Domestic Product (GDP) Implicit Price Deflators (IDP) are published quarterly, and seasonally adjusted. Historical data for the GNP IPD is presented in Report 278. GDP IPD information first published in NUEXCO Monthly Report 288. GNP IPD Base Year change from 1982 to 1987 in NUEXCO Monthly Report 284.

[4] US Bureau of Labor Statistics, Washington, DC: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in NUEXCO Monthly Report 278.

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Uranium Deliveries To The European Community[1]

— Compiled from data published by the Euratom Supply Agency —

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price		Spot Contracts[3] Average Price	
			in ECU per pound U_3O_8	in US Dollars per pound U_3O_8	in ECU per pound U_3O_8	in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19
1990	12,800	16.7	ECU 23.08	$29.39	ECU 7.60	$ 9.68
1991	12,900	13.0**P**	ECU 21.06	$26.09	ECU 7.31	$ 9.05

P = Preliminary **R** = Revised since last month

[1] The twelve European Community member nations are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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US Uranium Marketing Data

— Compiled from data published by the US Energy Information Administration [1] —

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers [2] (million pounds U_3O_8)	Average Price of Delivered Uranium [2] (\$/lb. U_3O_8)	Quantity of Uranium Imported [3] (million pounds U_3O_8)	Average Price of Imported Uranium (\$/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	\$16.10	3.6	n/a	1.2
1977	29.9	27.8	\$19.75	5.6	n/a	4.0
1978	37.0	31.6	\$21.60	5.2	n/a	6.8
1979	37.5	33.0	\$23.85	3.0	n/a	6.2
1980	43.7	35.0	\$28.15	3.6	\$43.10	5.8
1981	38.5	32.6	\$34.65	6.6	\$32.90	4.4
1982	26.9	23.5	\$38.37	17.1	\$25.19	6.2
1983	21.2	24.2	\$38.21	8.2	\$26.16	3.3
1984	14.9	22.5	\$32.65	12.5	\$21.86	2.2
1985	11.3	21.7	\$31.43	11.7	\$20.08	5.3
1986	13.5	18.9	\$30.01	13.5	\$20.07	1.6
1987	13.0	20.8	\$27.37	15.1	\$19.14	1.0
1988	13.1	17.6	\$26.15	15.8	\$19.03	3.3
1989	13.8	18.4	\$19.56	13.1	\$16.75	2.1
1990	8.9	20.5	\$15.70	23.7	\$12.55	2.0

P = Preliminary **R** = Revised since last month

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity.*
1984-1990: Energy Information Administration, *Uranium Industry Annual.*

[2] Data for 1976-1981 includes both domestic utilities and agents.

[3] Includes imports by domestic utilities and domestic suppliers.

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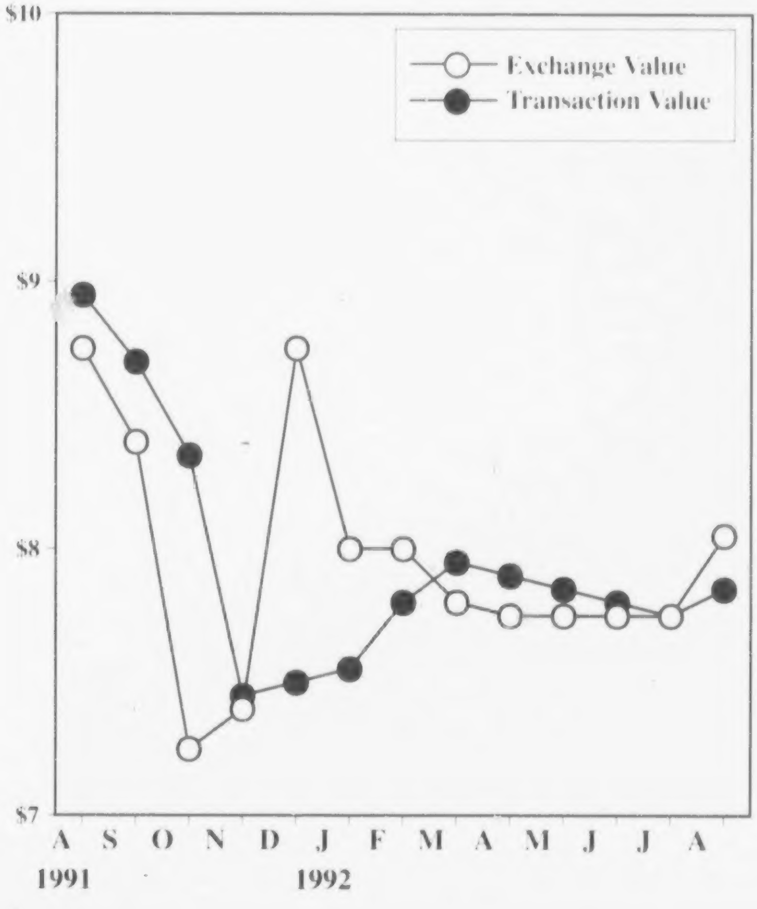

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The topic of converting HEU from dismantled nuclear weapons into commercial nuclear fuel has received more media attention than any other recent nuclear industry issue. Once the US-Russian agreement to purchase HEU is implemented, the first material could reach DOE customers by the latter part of this decade.

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- **Taiwan's Nuclear Program**

Taiwan has one of the world's fastest growing economies and presently relies on nuclear power to supply more than one-third of its electricity requirements. The country operates six reactors at three stations, and the government recently approved plans for construction of a fourth nuclear power station.

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To Our Readers

CONCORD/NUEXCO is pleased to announce that Dr. Boris V. Nikipelov of the Ministry of Atomic Energy and Industry (Minatom) of the former Soviet Union has become a founding member of CONCORD's newly established Technology Advisory Committee. Dr. Nikipelov previously was First Deputy Minister of Minatom. This new committee will focus on CONCORD's numerous advanced technology-based industries, including those being developed in conjunction with various organizations in the Commonwealth of Independent States (CIS). Dr. Nikipelov's expertise in nuclear technology and isotopes, as well as his in-depth knowledge of high technology development in the countries of the former Soviet Union will be a valuable asset to the Committee. CONCORD/NUEXCO is proud to have Dr. Nikipelov participate in this activity, and know that his broad scope of knowledge and his experience in transforming scientific achievement into economic reality, will enable the Technology Advisory Committee to become a valuable resource for the CONCORD group. The Technology Advisory Committee will interface regularly with CONCORD's International Advisory Committee.

* * *

The following is a press announcement released by NUEXCO and General Atomics on September 10.

Taking issue with efforts underway in the United States to impose special duties on the import of uranium produced in the Commonwealth of Independent States (CIS), General Atomics and NUEXCO announced today their common support for the duty-free trade of uranium and commercial uranium products.

Mr. Neal Blue, Chairman of General Atomics, said, "The free flow of goods between nations is a two-way street which stimulates and strengthens the economies of all countries. Discriminatory trade practices directed against the CIS are not consistent with the objectives of integrating the CIS into the free world economic systems and encouraging the prompt conversion of weapons stockpiles into fuel for commercial reactors."

Mr. Oren Benton, Chairman of NUEXCO, concurred by stating, "The free trade of uranium will significantly benefit US consumers of electric power while providing the nations of the CIS with critically needed foreign exchange from the sale of their uranium. Free trade is also the most effective means of encouraging the CIS in its efforts to convert nuclear weapons stockpiles into commercial reactor fuel."

General Atomics and NUEXCO's parent, CONCORD, have each been active in acquiring uranium reserves throughout the world, including acquisition by General Atomics of the former Chevron uranium properties and CONCORD's acquisition of a joint venture interest in Energy Fuels, previously the largest US uranium producer. NUEXCO, the world's largest uranium trading organization, is headquartered in Denver, Colorado. General Atomics, also active at various levels of the nuclear fuel cycle, is headquartered in San Diego, California. General Atomics subsidiary, Sequoyah Fuels Corp., is one of the two US converters of uranium used in the nuclear fuel fabrication process.

The companies also announced that Mr. James Graham, President and Chief Operating Officer of NUEXCO, will join General Atomics as the new head of its uranium acquisition, marketing, and storage activities. Jim Graham's duties will include liaison with NUEXCO, in an effort to identify areas of mutual interest. Mr. Graham's responsibilities within NUEXCO will be reassumed by Earl Hoellen as part of his Chief Executive Officer responsibilities.

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MARKET REVIEW

Market Values Summary

NUEXCO Market Values	This Report August 31, 1992	Last Report July 31, 1992	12 Months Ago August 31, 1991
EXCHANGE VALUE[1]	**\$8.05** / lb equivalent U_3O_8	\$7.75	\$8.75
UF_6 VALUE[2]	**\$24.25** / kg U as UF_6	\$23.50	\$26.25
LOAN RATE[3]	**3.0%** / annum	3.0%	3.5%
CONVERSION VALUE[4]	**\$1.50** / lb U as UF_6	\$1.50	\$1.60
SWU VALUE[5] **(0.3 w/o tails assay)**	**\$66** / SWU	\$66	\$67
TRANSACTION VALUE[6]	**\$7.85** / lb equivalent U_3O_8	\$7.75	\$8.95
Transactions	**28**	35	26
Months	**3**	3	3
Millions of Pounds	**8.3**	8.5	5.9

DEFINITIONS

[1] The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

[2] The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

[3] The **Loan Rate** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

[4] The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

[5] The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

[6] The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

a) Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;
b) At least ten transactions;
c) Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US\$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.
- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.
- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight-percent (w/o) ^{235}U and a product assay of 3.0 weight-percent ^{235}U, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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AUGUST MARKET REVIEW

(as of August 31, 1992)

OVERVIEW

Increased demand, primarily as a result of producer buying activity, led to an upturn in the uranium market in August. The Exchange Value rose $0.30, to $8.05 per pound U_3O_8, and the UF_6 Value increased by $0.75, to $24.25 per kgU as UF_6.

Although the average quantity per transaction was smaller in August compared to transactions concluded in June and July, the market remained fairly active, with ten near-term transactions reported. The nine concentrates sales and one natural UF_6 sale totalled nearly 2.0 million pounds equivalent U_3O_8 (**Table 1**). Year-to-date, 92 uranium transactions have been reported, totalling 29.7 million pounds equivalent U_3O_8. If the market remains near its present level of activity in September, total sales volume for 1992 will surpass in the third quarter the total volume achieved in all of 1991 (30.0 million pounds).

The Loan Rate remained unchanged at 3.0 percent per annum. Two loans were reported, totalling more than 400 thousand pounds equivalent U_3O_8. The Conversion Value also was unchanged, remaining at $1.50 per pound U as UF_6. No conversion sales were reported.

The SWU Value remained $66 per SWU. No near-term enrichment transactions were reported. However, two long-term sales were concluded in August, in which utilities purchased a total approaching 400 thousand SWU for delivery from 1994 through 2001.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	August 1992		Year-to-Date	
	No. of Sales	Volume [1]	No. of Sales	Volume [1]
Concentrates	9	1.7	62	18.7
Natural UF_6	1	0.3	18	5.7
EUP	0	0.0	12	5.3
Total [2]	10	2.0	92	29.7

[1] Million pounds equivalent U_3O_8

[2] Due to independent rounding, columns may not equal total.

NATURAL URANIUM AND CONVERSION

After four successive months at $7.75 per pound, the **Exchange Value** rose $0.30, to **$8.05** per pound U_3O_8 on August 31, marking the first time in 1992 that the Exchange Value has exceeded eight dollars per pound. (The most recent price spike reached $8.75 per pound on December 31, 1991). Uranium demand increased during August, as several producers entered the market to purchase material to fill future deliveries under their existing long-term contracts. Due to the uncertainty in the market created by the anti-dumping petition filed against the former Soviet Union, producers may have begun buying aggressively because they felt that current prices were advantageous.

Nine near-term concentrates transactions were reported from August, totalling more than 1.7 million pounds equivalent U_3O_8. Producers were buyers in eight of the nine transactions, with the other purchase made by an intermediary. Transactions concluded early in the month had prices near the July 31 Exchange Value, but prices gradually rose during the month to levels at or near the August 31 Exchange Value.

Although the market remained fairly active in August, smaller average transaction size resulted in a total monthly volume that was noticeably lower compared to June and July. The average uranium purchase quantity in August equalled roughly 200 thousand pounds, compared to more than 500 thousand pounds per transaction in June, and 350 thousand pounds in July. August's lower average transaction quantity can be attributed to changing producer buying tendencies. Producer buying activity has evolved

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over the past year or two: producers' current tendency is to buy smaller lots more frequently, in order to match specific delivery requirements under long-term contracts. This strategy permits the producer to lower its market risk when buying on the spot market to fulfill delivery commitments for contracts with market-related pricing terms.

* * *

Prices in the UF_6 market followed price movements in the concentrates market, and the August 31 **UF_6 Value** climbed \$0.75, to **\$24.25** per kgU as UF_6. Uranium hexafluoride is now selling at a slight discount (\$0.09) to the sum of the value of its components. Only one natural UF_6 transaction was reported, in which an intermediary purchased a moderate quantity of UF_6 for delivery near the end of this year.

* * *

Three transactions are reported in the **long-term uranium market**. US utilities made all three purchases: one involved concentrates; one, natural UF_6; and one, enriched uranium product (EUP). Together, the transactions totalled almost 1.7 million pounds equivalent U_3O_8 for delivery during the period 1992 through 1997.

Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply[1]	Active Demand[1]
• Uranium (thousand lbs equivalent U_3O_8)	8,240	1,305
• Supply/Demand Ratio:	6.3	
• Loan (thousand lbs equivalent U_3O_8)	7,250	1,250
• Conversion (thousand lbs U as UF_6)	3,300	620
• SWU (thousand SWUs)	1,085	50

[1] Supply and Demand tables in the Market Review section of this Report provide details for each category.

* * *

The **Transaction Value** reversed its steady downward trend of the past four months, and rose \$0.10, to **\$7.85** per pound U_3O_8. August's higher-priced sales led to the increase. The August 31 Transaction Value was based on 28 transactions over three months involving 8.3 million pounds equivalent U_3O_8.

* * *

Active uranium supply increased by 1.2 million pounds during August, to **8.2** million pounds equivalent U_3O_8. New demand throughout the month was filled as it emerged, and at month-end, total **active uranium demand** had risen by only 420 thousand pounds, to **1.3** million pounds equivalent U_3O_8. Since active supply did not increase as much proportionately, the **supply/demand ratio** fell to **6.3**.

* * *

The **Loan Rate** remained unchanged at **3.0** percent per annum. Loan supply is nearly six times larger than loan demand (**Table 2**), even though activity has been relatively low in the market. Two uranium loans were reported from August: intermediaries borrowed a total of more than 400 thousand pounds equivalent U_3O_8 in the form of concentrates from a producer and a utility.

* * *

The **Conversion Value** also was unchanged, remaining at **\$1.50** per pound U as UF_6 for the third consecutive month. The conversion market remained quiet in August: no conversion transactions were reported.

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ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

The **SWU Value** was unchanged at **$66** per SWU. Demand for spot enrichment remains weak, and sellers have not been very aggressive; no near-term transactions were reported from August. The secondary enrichment market has been fairly quiet recently, although one utility entered the market near the end of August, and several other utilities are expected to enter within the next few months. Two long-term enrichment sales were reported. In one, a utility purchased EUP containing a moderate quantity of SWU and feed for delivery in 1994 and 1995. In the other transaction, a US utility purchased a fairly large quantity of SWU for delivery during the period 1996 through 2001.

Table 3
ENRICHMENT PRICES
(August 31, 1992)

Prices	This Month Report 289	Last Month Report 288	12 Months Ago Report 277
NUEXCO SWU Value ($US per SWU)	66	66	67
US DOE SWU prices: ($US per SWU)			
USC	121.50[1]	121.50[1]	117.85[2]
AFC	153.00[3]	153.00[3]	153.00[3]
Requirements	157.00[3]	157.00[3]	157.00[3]
Incentive Price (IP2)	104.67[4]	104.67[4]	100.68[5]
Calculated worth of enriched UF_6[6]: ($US per KgU as UF_6)			
2.0 w/o ^{235}U	213	209	223
2.5 w/o ^{235}U	298	294	311
3.0 w/o ^{235}U	386	381	403
3.5 w/o ^{235}U	476	470	496
4.0 w/o ^{235}U	567	560	591
4.5 w/o ^{235}U	660	652	687

[1] Effective 10/1/91.
[2] Effective 10/1/89 to 9/30/91.
[3] Effective since 10/1/84.
[4] Provisional IP2 for FY92: Effective 10/1/91 to 9/30/92, for up to 30% of annual requirements.
[5] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.
[6] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 w/o ^{235}U tails assay.

RECENT TRANSACTIONS

Uranium Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5520A	1994-1995	301-600	See remarks	Utility	Intermediary	Contained in EUP
5523	1992-1997	601-1,000	See remarks	Utility	**R**	UF_6, Base escalated
5524	1993	101-300	90-97	Producer	Intermediary	
5529	1992	50-100	98-102	Producer	Intermediary	
5530	1993	301-600	98-102	Producer	Intermediary	
5531	1992	101-300	98-102	Intermediary	**R**	UF_6
5532	1993	101-300	98-102	Intermediary	Intermediary	
5533	1992	101-300	98-102	Producer	Intermediary	
5534	1992	Less than 50	98-102	Producer	Intermediary	
5536	1992-1993	101-300	98-102	Producer	Intermediary	
5538	1992	101-300	98-102	Producer	Producer	
5539	1992	301-600	98-102	Producer	Intermediary	
5541	1992-1997	600-1,000	See remarks	Utility	Producer	Price related to market

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110,* represent percentages (rounded to whole numbers) of the appropriate current Exchange Value or UF_6 Value. The endpoints of each range are included within that range.

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RECENT TRANSACTIONS

Natural Uranium Loans[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Loan Rate	Borrower	Lender	Remarks
5535	1992	101-300	103-110	Intermediary	Producer	
5540	1992	101-300	98-102	Intermediary	Utility	

Conversion Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range[2] of Current Conversion Value	Buyer	Seller	Remarks

No conversion sales are reported.

Enrichment Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity[3] (thousand SWU)	Price Within Percentage Range[2] of Current SWU Value	Buyer	Seller	Remarks
5520B	1994-1995	50-100	See remarks	Utility	Intermediary	Contained in EUP
5521	1996-2001	301-600	See remarks	Utility	Enricher	Series of fixed prices

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110,* represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., **X** dollars less than DOE's USC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

Uranium Supply

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Quantity (Thousand Pounds equivalent U_3O_8) Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
90-1078A	235	—	1992-1993	UF_6e
91-1505	1,250	—	1992-1993	
91-1507	500	—	1992	
91-1511	1,305	—	1992	UF_6/UF_6e
91-1512*	785	—	1993	UF_6
92-1141*	200	—	1992	
92-1194	200	—	1992	
92-1201A	840	—	1993	UF_6e
92-1257A*	1,510	—	1992-1993	UF_6e
92-1501A	915	—	1992	UF_6e
92-1512*	500	—	1993	
91-1268	—	600 per year	1992-1999	
92-1129	—	2,600 per year	1993-1999	
92-1185	—	2,600 per year	1993-1999	
92-1261*	—	520 per year	1993-2000	
92-1513*	—	1,300 per year	1992-1999	
TOTAL	**8,240**			
INACTIVE	**2,800**			
AVAILABLE TO LOAN:				
ACTIVE				
92-1072*	3,100	—	1992	UF_6
92-1074	1,000	—	1992	
92-1206*	500	—	1992	
92-1258*	1,250	—	1993	
92-1503*	1,000	—	1992	
92-1515*	400	—	1992	
TOTAL	**7,250**			
INACTIVE	**1,610**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 92-1509, 92-1195

Active Projects removed since last month: 92-1214

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SUPPLY AND DEMAND

Uranium Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Quantity (Thousand Pounds equivalent U_3O_8) Intermediate or Long-term[2]	Delivery Period	Remarks
INQUIRIES TO PURCHASE:				
ACTIVE				
92-1152A	15	—	1993	UF_6e
92-1227	270	—	1992	U_3O_8/UF_6
92-1231*	25	—	1992	U_3O_8/UF_6
92-1255*	125	—	1992-1993	
92-1256*	190	—	1992	
92-1259*	150	—	1993	U_3O_8/UF_6
92-1264A*	30	—	1992-1993	UF_6e
92-1514*	500	—	1993	U_3O_8/UF_6
91-1184	—	350 per year	1993-1997	
92-1199	—	2,000	1992-1999	
92-1223	—	400 per year	1997-2000	U_3O_8/UF_6
92-1226	—	300 per year	1994-1996	
92-1235*	—	500 per year	1995-2000	U_3O_8/UF_6
92-1245*	—	1,960	1993-2000	UF_6
92-1252*	—	4,000	1995-2000	
92-1253*	—	100 per year	1996-2003	
TOTAL	**1,305**			
INACTIVE	**1,785**			
INQUIRIES TO BORROW:				
ACTIVE				
92-1505	500	—	1992	
92-1511	750	—	1992	
TOTAL	**1,250**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: 91-1197, 92-1164A, 92-1225

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SUPPLY AND DEMAND

Conversion Supply and Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF₆) Within 3 Years[1]	Beyond 3 Years[1]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1500	400	—	1992	
91-1501	1,100	—	1992	
92-1190*	300	—	1993	
92-1507	500	—	1992	
92-1516*	1,000	—	1992	
TOTAL	**3,300**			
INACTIVE	*None reported*		—	
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1275	620	—	1992-1993	
92-1178	—	3,300 per year	1992-1995	
TOTAL	**620**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: *none*

SUPPLY AND DEMAND

SWU Supply and Demand

NUEXCO Project Number	Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
	Quantity (Thousand Pounds equivalent U_3O_8)			
AVAILABLE FOR SALE:				
ACTIVE				
90-1078B	75	—	1992-1993	UF_6e
91-1509	200	—	1992	
91-1515	100	—	1992	
92-1201B	180	—	1993	UF_6e
92-1257B*	150	—	1992-1993	UF_6e
92-1501B	130	—	1992	UF_6e
92-1124	250	250 per year	1992-1994	
TOTAL	**1,085**			
INACTIVE	**50**			
INQUIRIES TO PURCHASE:				
ACTIVE				
92-1152B	5	—	1993	UF_6e
92-1236*	40	—	1993	
92-1264B*	5	—	1992-1993	UF_6e
90-1196	—	60 per year	1995 on	
91-1152	—	2,700	1995-2001	
92-1016	—	170 per year	1996-2006	
TOTAL	**50**			
INACTIVE	**140**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: 92-1164B

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES[1]

Australia *to* **Hungary**	**Australia** (dollar)	**Belgium** (franc)	**Canada** (dollar)	**China** (renminbi)	**CSFR** (koruna)	**EC** (ecu)	**Finland** (markka)	**France** (franc)	**Germany** (mark)	**Hungary** (forint)
EXCHANGE VALUE										
per pound equivalent U_3O_8 as Concentrates										
This Month (Aug 31, 1992)	**11.25**	**232.93**	**9.62**	**43.75**	**210.10**	**5.58**	**31.13**	**38.46**	**11.29**	**597.71**
Last Month (July 31, 1992)	10.41	235.42	9.16	42.39	208.24	5.61	31.35	38.60	11.43	589.47
12 Months Ago (Aug 31, 1991)	11.15	314.52	9.99	46.79	—.—	7.42	37.11	51.90	15.29	—.—
per kg U as Concentrates										
This Month (Aug 31, 1992)	**29.25**	**605.56**	**25.01**	**113.74**	**546.23**	**14.52**	**80.92**	**99.99**	**29.34**	**1,554**
Last Month (July 31, 1992)	27.07	612.04	23.82	110.21	541.38	14.58	81.50	100.34	29.71	1,532
12 Months Ago (Aug 31, 1991)	29.00	817.69	25.97	121.64	—.—	19.30	96.47	134.93	39.74	—.—
UF_6 VALUE										
per kg U as UF_6										
This Month (Aug 31, 1992)	**33.89**	**701.68**	**28.98**	**131.79**	**632.92**	**16.82**	**93.77**	**115.86**	**34.00**	**1,801**
Last Month (July 31, 1992)	31.58	713.85	27.78	128.55	631.45	17.00	95.06	117.03	34.66	1,787
12 Months Ago (Aug 31, 1991)	33.46	943.57	29.97	140.36	—.—	22.27	111.32	155.70	45.86	—.—
TRANSACTION VALUE										
per pound equivalent U_3O_8 as Concentrates										
This Month (Aug 31, 1992)	**10.97**	**227.14**	**9.38**	**42.66**	**204.88**	**5.45**	**30.35**	**37.50**	**11.01**	**582.86**
Last Month (July 31, 1992)	10.41	235.42	9.16	42.39	208.24	5.61	31.35	38.60	11.43	589.47
12 Months Ago (Aug 31, 1991)	11.41	321.71	10.22	47.86	—.—	7.59	37.96	53.09	15.64	—.—
per kg U as Concentrates										
This Month (Aug 31, 1992)	**28.52**	**590.52**	**24.39**	**110.91**	**532.66**	**14.16**	**78.91**	**97.50**	**28.61**	**1,515**
Last Month (July 31, 1992)	27.07	612.04	23.82	110.21	541.38	14.58	81.50	100.34	29.71	1,532
12 Months Ago (Aug 31, 1991)	29.66	836.38	26.56	124.42	—.—	19.74	98.68	138.02	40.65	—.—
CONVERSION VALUE										
per pound U as UF_6										
This Month (Aug 31, 1992)	**2.10**	**43.40**	**1.79**	**8.15**	**39.15**	**1.04**	**5.80**	**7.17**	**2.10**	**111.38**
Last Month (July 31, 1992)	2.02	45.57	1.77	8.21	40.31	1.09	6.07	7.47	2.21	114.09
12 Months Ago (Aug 31, 1991)	2.04	57.51	1.83	8.56	—.—	1.36	6.79	9.49	2.80	—.—
per kg U as UF_6										
This Month (Aug 31, 1992)	**4.62**	**95.69**	**3.95**	**17.97**	**86.31**	**2.29**	**12.79**	**15.80**	**4.64**	**245.54**
Last Month (July 31, 1992)	4.44	100.45	3.91	18.09	88.86	2.39	13.38	16.47	4.88	251.53
12 Months Ago (Aug 31, 1991)	4.50	126.79	4.03	18.86	—.—	2.99	14.96	20.92	6.16	—.—
SWU VALUE										
per SWU at 0.30% ^{235}U Tails Assay										
This Month (Aug 31, 1992)	**92.24**	**1,910**	**78.87**	**358.69**	**1,723**	**45.79**	**255.20**	**315.32**	**92.53**	**4,901**
Last Month (July 31, 1992)	88.69	2,005	78.03	361.02	1,773	47.75	266.97	328.69	97.33	5,020
12 Months Ago (Aug 31, 1991)	85.40	2,408	76.49	358.26	—.—	56.85	284.14	397.41	117.05	—.—

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[1] Calculated using currency exchange rates **for** the last business day of the month, as published in *The Wall Street Journal*.

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES[1]

Italy *to* **United States**	**Italy** (lira)	**Japan** (yen)	**Netherlands** (guilder)	**S. Africa** (comm. rand)	**S. Korea** (won)	**Spain** (peseta)	**Sweden** (krona)	**Switzerland** (franc)	**Taiwan** (dollar)	**UK** (pound)	**USA** (dollar)
EXCHANGE VALUE											
per pound equivalent U_3O_8 as Concentrates											
This Month (Aug 31, 1992)	**8,617**	**989.79**	**12.72**	**22.04**	**6,325**	**733.02**	**41.28**	**10.05**	**199.88**	**4.05**	**8.05**
Last Month (July 31, 1992)	8,643	985.00	12.89	21.43	6,102	728.66	41.51	10.22	191.35	4.02	7.75
12 Months Ago (Aug 31, 1991)	11,404	1,197	17.21	25.14	6,407	951.29	55.45	13.33	231.18	5.21	8.75
per kg U as Concentrates											
This Month (Aug 31, 1992)	**22,402**	**2,573**	**33.08**	**57.29**	**16,443**	**1,906**	**107.32**	**26.12**	**519.65**	**10.52**	**20.93**
Last Month (July 31, 1992)	22,469	2,561	33.50	55.72	15,865	1,894	107.92	26.57	497.46	10.46	20.15
12 Months Ago (Aug 31, 1991)	29,647	3,112	44.75	65.37	16,657	2,473	144.16	34.65	601.01	13.54	22.75
UF_6 VALUE											
per kg U as UF_6											
This Month (Aug 31, 1992)	**25,958**	**2,982**	**38.33**	**66.38**	**19,052**	**2,208**	**124.36**	**30.26**	**602.13**	**12.20**	**24.25**
Last Month (July 31, 1992)	26,207	2,987	39.08	64.99	18,504	2,209	125.87	30.99	580.22	12.20	23.50
12 Months Ago (Aug 31, 1991)	34,211	3,591	51.64	75.43	19,221	2,854	166.35	39.98	693.53	15.63	26.25
TRANSACTION VALUE											
per pound equivalent U_3O_8 as Concentrates											
This Month (Aug 31, 1992)	**8,403**	**965.20**	**12.41**	**21.49**	**6,168**	**714.81**	**40.26**	**9.80**	**194.91**	**3.95**	**7.85**
Last Month (July 31, 1992)	8,643	985.00	12.89	21.43	6,102	728.66	41.51	10.22	191.35	4.02	7.75
12 Months Ago (Aug 31, 1991)	11,664	1,224	17.61	25.72	6,553	973.04	56.72	13.63	236.46	5.33	8.95
per kg U as Concentrates											
This Month (Aug 31, 1992)	**21,846**	**2,509**	**32.26**	**55.87**	**16,034**	**1,858**	**104.66**	**25.47**	**506.74**	**10.26**	**20.41**
Last Month (July 31, 1992)	22,469	2,561	33.50	55.72	15,865	1,894	107.92	26.57	497.46	10.46	20.15
12 Months Ago (Aug 31, 1991)	30,325	3,183	45.78	66.86	17,037	2,530	147.45	35.44	614.74	13.85	23.27
CONVERSION VALUE											
per pound U as UF_6											
This Month (Aug 31, 1992)	**1,606**	**184.43**	**2.37**	**4.11**	**1,179**	**136.59**	**7.69**	**1.87**	**37.24**	**0.75**	**1.50**
Last Month (July 31, 1992)	1,673	190.65	2.49	4.15	1,181	141.03	8.03	1.98	37.04	0.78	1.50
12 Months Ago (Aug 31, 1991)	2,085	218.88	3.15	4.60	1,172	173.95	10.14	2.44	42.27	0.95	1.60
per kg U as UF_6											
This Month (Aug 31, 1992)	**3,540**	**406.61**	**5.23**	**9.05**	**2,598**	**301.12**	**16.96**	**4.13**	**82.11**	**1.66**	**3.31**
Last Month (July 31, 1992)	3,688	420.30	5.50	9.15	2,604	310.92	17.71	4.36	81.65	1.72	3.31
12 Months Ago (Aug 31, 1991)	4,597	482.54	6.94	10.14	2,583	383.50	22.35	5.37	93.19	2.10	3.53
SWU VALUE											
per SWU at 0.30% ^{235}U Tails Assay											
This Month (Aug 31, 1992)	**70,649**	**8,115**	**104.31**	**180.67**	**51,854**	**6,010**	**338.46**	**82.37**	**1,639**	**33.19**	**66.00**
Last Month (July 31, 1992)	73,603	8,388	109.74	182.52	51,969	6,205	353.51	87.03	1,630	34.26	66.00
12 Months Ago (Aug 31, 1991)	87,319	9,166	131.81	192.53	49,059	7,284	424.59	102.04	1,770	39.88	67.00

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[1] Calculated using currency exchange rates for the last business day of the month, as published in *The Wall Street Journal*.

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RECENT DEVELOPMENTS

USA

Anti-Dumping Decision Approaches

Some of the uncertainty surrounding the uranium anti-dumping investigation could be resolved by mid-October. The Department of Commerce (DOC) is scheduled to render its final determination on October 16, and that date is driving the timeline described herein.

It is public knowledge that settlement negotiations involving DOC and some of the six Republics of the Commonwealth of Independent States (CIS) ~~named in the~~ investigation (Russia, Uzbekistan, Kazakhstan, Ukraine, Tajikistan, and Kyrgyzstan) have been underway for several weeks, but the outcome remains in doubt. Four types of settlement are permitted under the statute:

1) Termination of the investigation upon withdrawal of petition.
2) Suspension of the investigation upon acceptance of an agreement to eliminate completely sales at less than fair value or to cease exports of merchandise.
3) Suspension of the investigation upon acceptance of an agreement eliminating injurious effects.
4) Suspension of the investigation upon acceptance of a quantitative restraint (quota) under the special rule for non-market economy (NME) countries.

All four possibilities present difficulties, but DOC counsel has offered the opinion, for the public record, that "only the settlement option that Congress crafted specifically for non-market economies such as the former Soviet Republics appears capable of settling the investigation. This would require neither reference data from the former Soviet Republics nor the consent of the U.S. industry". Such an agreement would have to be determined (by DOC) to be in the public interest and effectively monitorable; it also would have to "prevent imports that come in under the quota from undercutting or suppressing the prices of domestic producers."

DOC counsel also stated this type of agreement would avoid two key legal hurdles that could confront the other

ANTI-DUMPING PETITION TIMELINE OF UPCOMING EVENTS

Sept 16 — Draft settlement agreement, if any, should be issued to petitioners, respondents, and interested parties.

Sept 16 — Case briefs submitted to Department of Commerce (DOC).

Sept 23 — Rebuttal briefs submitted to DOC.

Oct 2 — DOC oral hearing.

Oct 5 — International Trade Commission (ITC) staff report.

Oct 16 — DOC final determination. If negative, the investigation terminates.

Oct 20 — ITC oral hearing, if the DOC determination was affirmative.

Dec 1 — Final ITC determination. If negative, investigation ends.

Dec 7 — If ITC final determination is affirmative, final dumping order issued by DOC.

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types of settlements. "First, the independent states would not have to adjust their prices based on the very high BIA [best information available] margins anticipated in the preliminary determination. Second, the Department could enter into such an agreement with an NME country over the objections of the domestic industry." A significant uncertainty would still remain even if a suspension agreement is reached, either side could still require the continuation of the case to its conclusion.

Absent a settlement, DOC is scheduled to issue its final determination by October 16. If the DOC decision is affirmative (that is, if it rules dumping has taken place), the International Trade Commission (ITC) has 45 days, until December 1, to determine if the imports have caused or threaten to cause material injury to the US uranium industry. If the ITC determination finds injury or threat of injury, DOC will issue a final dumping order by December 7, instructing the US Customs Service to collect anti-dumping duties in accordance with the final DOC determination. The final duties are reviewable in a subsequent proceeding, normally within one year.

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WASHINGTON FOCUS

by Linda L. Gunter

"How many days has it taken Congress to pass a National Energy Strategy?" President Bush asked rhetorically at the Republican National Convention in Houston. "Five hundred thirty-two days and still counting", he concluded. During his acceptance speech for the presidential nomination, he called on Congress to pass his energy strategy. Privately, many in the industry have been critical of the administration for not actively pushing the bill through Congress. Earlier in the month, President Bush invited chief executive officers of several energy companies to a meeting to discuss which issues he should support, as Congress prepares to go to conference on the energy bill (HR776). Nuclear industry representatives pressed for a resolution to the spent fuel storage impasse at Yucca Mountain, but it remains to be seen whether a politically weakened President Bush will spend any of his limited political capital on the energy bill, as Congress considers the bill this autumn.

Energy Bill Conference Committee Appointed

Prior to the congressional recess for summer vacations and the Republican convention, Speaker of the House Tom Foley (D-WA) appointed conference committee representatives. As expected, Energy & Commerce Committee Chairman John Dingell (D-MI), Interior Committee Chairman George Miller (D-CA), and their committee representatives will play a key role in decisions on the nuclear provisions. On the Senate side, the conferees are members of the Senate Energy & Natural Resources Committee, and two members of the Environment & Public Works Committee (Senators Burdick and Chafee—who are not nuclear industry supporters). On the titles regarding uranium enrichment restructuring, in addition to the two House committees mentioned above, members of the Science, Space & Technology and Ways and Means committees will also play a role.

The largest subcommittee of the conference will negotiate Title XXIV of the House energy bill, which would prevent any ship carrying plutonium from using a US port (except for defense purposes) unless the container is certified by the US Nuclear Regulatory Commission (NRC). Forty-four members from four House committees were named, including members of Energy & Commerce, Interior, Foreign Affairs, and Merchant Marine & Fisheries. The Senate bill does not have any provisions on this issue, so Senate conferees will be free to negotiate as they see fit. The provisions of the House bill would require the NRC to establish additional standards in order to certify a container. When these provisions were first accepted in the Interior Committee, they caught much of the nuclear industry by surprise, for it appeared that anti-nuclear groups might have succeeded in wielding their influence on the transportation sector of the nuclear fuel cycle.

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NRC Fee Schedule

◇ As of August 24, the NRC increased its licensing and inspection fee schedule for FY1992 by seven percent, in order to comply with its statutory obligation to recover 100 percent of its budget. The total amount expected to be recovered for FY1992 is $492.5 million. Nuclear utilities will pay approximately $3.1 million this fiscal year, compared to approximately $2.8 million last year. For FY1992, base fees for materials licensees are as follows: those producing low-enriched uranium must pay $683,000; converters, $381,000 each; and fuel fabricators, a base fee of $683,000. Uranium companies will be assessed a fee based upon the class into which they fall—uranium milling companies, solution mining companies, and other uranium recovery facilities. Sixty percent of the cost of regulating the uranium companies is allocated to uranium mills (Class I), which will be charged $167,000; 20 percent is allocated to solution mining licensees who do not generate mill tailings (Class II)—$73,200; the remaining 20 percent is allocated to other uranium recovery facilities—$58,800.

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INDUSTRY BRIEFS

Cogema Announces Plan To Merge UG and Interuran

Late in August, Cogema released its plan to merge the German firms of Urangesellschaft (UG) and Interuran. The two companies, both majority-owned by Cogema, will be merged this September into one new company (still named UG), although some of Interuran's activities will be transferred to other Cogema subsidiaries. More than 69 percent of the new UG is held by Cogema's wholly owned German subsidiary, Cogema Uran Services GmbH. The remaining ownership is shared among German energy companies of PreussenElektra AG (10.3%), Steag (10.3%), Badenwerk AG (5%), and Energieversorgung Schwaben [EVS] (5%).

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Bulgaria Announces 1994 Cessation of U Mining

Citing production costs in excess of US$20 per pound U_3O_8, Bulgaria's Minister of Industry recently announced that Redki Metali, the state-owned uranium mining and milling company, will close operations by 1994. Attempts will be made to locate new jobs in other sectors of the economy for the 3,000 employees displaced by the closure.

Reactor Records and Milestones

Boiling water reactors (BWR) set two records in August: one for length of operation, the other for total generation. Philadelphia Electric Company's (PECO) Limerick 2, a 1,055-MWe BWR, set a BWR record for continuous operation of 424 days, as of the beginning of August. Since the unit is not scheduled for a refueling outage until January 1993, PECO hopes to surpass on October 21 the light-water reactor record of 502 days. That record was set on April 21, 1992, by Florida Power & Light Company's St. Lucie 2, a 839-MWe pressurized water reactor (PWR).

Japan Atomic Power Company's Tokai 2 set a world record for BWRs early in August when it surpassed the 100 billion gross kilowatt-hour (kWh) lifetime generation mark. The 1,056-MWe reactor began commercial operation in 1978. This generation mark is also a Japanese record for all reactor types.

Electricité de France's Fessenheim nuclear power station also achieved a milestone in August when it surpassed the 150 billion kWh lifetime generation mark. The two 880-MWe PWRs at the Fessenheim station went into commercial operation in 1977 and 1978.

Wyoming Governor Vetoes Fremont County MRS Study

Wyoming Governor Mike Sullivan vetoed Fremont County's request for a Department of Energy (DOE) grant for Phase IIA studies on the possible siting of a monitored retrievable storage (MRS) facility in the county. Citing the amount of time and money already spent by DOE simply on the suitability study for Yucca Mountain, the governor indicated his lack of confidence in DOE's ability to construct a permanent storage facility and thus to ensure that a Wyoming MRS not become a *de facto* permanent storage facility. He also questioned the necessity of an MRS versus continued storage at nuclear reactor stations.

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Cleveland Electric to Build Permanent LLW Facility

In early August, Cleveland Electric Illuminating Co. (CEI) announced plans to start construction this fall of its own low-level radioactive waste (LLW) storage facility. The facility will be built at the Perry nuclear power station, at an estimated cost of $1.7 million. CEI cited its uncertain future access to LLW storage facilities, and a potential savings of $250,000 per year, as the motivating factors in its decision.

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PGE Board Reviews Trojan Economics, Sets 1996 Closure

Portland General Electric Company's (PGE) board of directors announced on August 10 that, following an economic review of the Trojan nuclear power plant (on a least-cost basis), the plant would be closed in 1996, 15 years short of the expiration of its NRC license. The four-year interval before shutting down the reactor will allow time for the development of new generating capacity (fired by natural gas and renewables) and new conservation measures. This was considered a better alternative than closing the 1,095-MWe PWR this year, as proposed by two measures in this November's Oregon state election. Three previous times Trojan has won such a public "vote of confidence" by defeating anti-Trojan referenda.

The PGE board determined that operation of Trojan beyond 1996 would require replacement of the steam generators, and such cost could not be justified. The board estimated that the 1996 closure would save $100-200 million, compared to operating the plant until its license expired. The closure plan still must be approved by the Trojan owners' committee and the Oregon Public Utilities Commission.

Trojan becomes the third reactor in the last year now scheduled by their owners for premature closure. The other two are Yankee Atomic Electric Company's plant at Rowe, Massachusetts, which began operation in 1961, and San Onofre 1 (initial operation in 1968), operated by Southern California Edison Company.

Cogema Signs Cooperation Agreement with Russia's Minatom

On July 31 in Moscow, Russia, Cogema of France signed an agreement with the Ministry of Atomic Energy of the Russian Federation (Minatom) covering broad areas of the nuclear fuel cycle. A working group will be established to specify the fine details of the agreement. One of the clearest areas of cooperation will be Cogema's investment in Minatom's centrifuge enrichment plant at Tomsk. The plant will be upgraded to handle large volumes of reprocessed uranium, specifically that produced from Cogema's La Hague plant. The Tomsk plant primarily will need new equipment for front-end feed and bypass operations to handle the increased volume of reprocessed uranium.

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Kozloduy 6 Restarted

Bulgaria's Kozloduy 6 (a 953-MWe VVER) was restarted on July 31 after a nearly three-month shutdown. Due to Bulgaria's troubled economy, the reactor's operator, the State Economic Union, has major financial constraints and was forced to conserve its uranium fuel for vital winter heating requirements by stopping power production during the summer.

Japanese Nuclear Project Breaks 27-Year Old Stalemate

Japan's plans for a 4,400-MWe nuclear power station on the coastline of the Aomori Prefecture finally took a step forward in August when a stalemate with local fishing cooperatives was resolved. A plan for four 1,100-MWe BWRs was proposed in 1965, but promptly ran into complications with local fishing cooperatives. Fishing cooperatives effectively control Japan's coastline through fishing rights, and Japan has few other sources of water to supply nuclear power stations. In this case, the local fishing cooperatives wanted financial compensation for giving up their rights to 52 square kilometers of coastal waters; the cooperatives initially refused to yield their rights at all. The lengthy deadlock was finally overcome on August 14 when the two largest cooperatives agreed to a compensation package worth US$138.5 million (¥18 billion), equivalent to over US$100,000 per co-op member. Agreements still must be reached with four other small cooperatives, but these agreements are expected to be concluded easily.

Following the fishing cooperative's agreements, the 9,000 residents of the village of Higashidori agreed in early September to a total compensation package (payments plus property taxes) of over US$528 million (¥66 billion).

According to the plan for the new station, Tokyo Electric Power Company and Tohoku Electric Power Company each are to build two units. Station construction is now planned to begin in 1996, with initial reactor commissioning in 2002.

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EdF Orders New Civaux Reactor, Studies More

In July, Electricité de France (EdF) president, Gilles Menage, announced that EdF's board of directors had approved the construction of a new nuclear power plant at its Civaux station. Additionally, the board approved studies of the feasibility of adding nuclear units at the St. Albans, Flamanville, or Penly stations. All three stations currently have two 1,300-MWE-class pressurized water reactors (PWR) in operation. (Penly 2 is currently in pre-commercial operation testing.) The Civaux station currently has only one unit, a 1,455-MWe PWR under construction and scheduled for commercial operation in 1997. The second unit, likely to be a twin to Civaux 1, will be ordered in 1993 and should reach commercial operation by 1999.

Japanese Report Outlines HLW Management

The Japanese Atomic Energy Commission recently issued a report entitled "High-Level Radioactive Waste (HLW) Management" that provides an initial outline of HLW management in Japan, and those responsible. According to the report, a new organization will be formed by the year 2000 that will be responsible for HLW management, as well as building and operating an HLW repository. The Japanese government will take responsibility for assuring that the geological disposal is performed according to regulations. Power Reactor and Nuclear Fuel Development Corporation will conduct geological and environmental research, and the country's utilities will fund the disposal costs.

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Continued Operation Approved for 30-Year-Old Bradwell 2

The United Kingdom's (UK) Nuclear Installations Inspectorate has approved the continued operation of Nuclear Electric's Bradwell 2 under the reactor's existing license. Originally expected to have economic lifetimes of 20 years, Nuclear Electric's Magnox reactors have been consistently improved, and Bradwell 2, a 123-MWe gas-cooled reactor, will be the UK's first reactor to surpass 30 years of operation. It is now planned for a total operational life of 36 years.

Yankee Atomic Receives Possession-Only License

The US Nuclear Regulatory Commission has issued the Yankee Atomic Electric Company a "possession-only" license for the company's closed 167-MWe pressurized water reactor in Rowe, Massachusetts. The license will allow Yankee to lower its maintenance costs by eliminating its NRC user fees ($500,000 in 1991) and emergency planning exercises, reducing the plant's staff by over 70 percent, and lowering its liability insurance costs. Yankee could begin decommissioning the plant in 1996 if the NRC approves its decommissioning plan by 1995, but may wait until the year 2000 in order for DOE repository issues to clear.

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BLENDING RUSSIAN HEU

The topic of dismantling Russian nuclear weapons and converting the contained uranium into commercial nuclear fuel has received more media attention than any other issue involving the nuclear industry in recent weeks. On August 31, 1992, President George Bush announced that the US government and the Russian Federation had initialed an agreement for the US purchase of highly-enriched uranium (HEU) from dismantled Russian nuclear weapons. If a final agreement is signed and all of the hurdles to making the HEU available and usable can be overcome, the US Department of Energy (DOE) could begin supplying some of this material to its customer base by the latter part of this decade.

US-RUSSIAN AGREEMENT

The recently initialed agreement between the USA and Russia consists of two main parts. Part One indicates that both parties will begin negotiations to convert, as soon as practical, HEU from dismantled Russian nuclear weapons to low-enriched uranium (LEU) fuel for use in commercial nuclear reactors. It notes that appropriate measures need to be established to ensure that all applicable non-proliferation, physical security, material accounting and control, and environmental requirements are met.

Part Two of the agreement states that an implementing contract to accomplish the objectives in Part One should be signed within twelve months, and will allow the following:

- A minimum of 10 metric tons of HEU to be converted annually for the first five years and 30 metric tons per year thereafter.
- The purchase by the Department of Energy of HEU for conversion to LEU, and its sale for commercial purposes.
- The purchase by DOE of LEU diluted from HEU converted at facilities in Russia, for sale as commercial fuel once Russian facilities begin operation.
- Participation by the US private sector.
- Use by the Russian Federation of a portion of the proceeds from the HEU sales to upgrade the safety of nuclear reactors in the former Soviet Union.
- Use by the Russian Federation, at its discretion, of a portion of the proceeds from the HEU sales to finance construction and operation of HEU to LEU conversion facilities in Russia.

The present agreement, which still requires approval from both governments, states that all US funding for the HEU purchases will come from savings in DOE's enrichment operations. These purchases are envisioned at levels that would allow DOE to lower production costs at its enrichment facilities through reduced electricity demand. However, payment to Russia for its HEU may not occur until the cost (including savings) of the converted LEU is calculated and payments for delivery are received from DOE customers.

The agreement represents a major step forward in the area of weapons reduction and demonstrates a strong intent on the part of both governments to find a solution for disposal of HEU from Russia's nuclear weapons. As a result of the US-Soviet arms-reductions treaties signed in the past few years, Russia has at least 500 metric tons of HEU that could be made available from weapons being dismantled. [Russia is reported to have more than 1,000 metric tons of HEU contained in weapons inventory.] The issue of disposition of an equivalent amount of HEU from dismantlement of US weapons has not been addressed, but could, if politically feasible, represent an opportunity to add billions of dollars to the US Treasury, as well as allow possible closure of one of DOE's remaining gaseous diffusion plants (GDP).

Prior to this inter-government agreement, another agreement involving Russian HEU was announced. On July 22, Allied-Signal Inc. and Nuclear Fuel Services Inc. (NFS), both of the USA, announced that they had signed a protocol with the Russian Ministry of Atomic Energy (Minatom) and the Russian Academy of Sciences to convert HEU from dismantled weapons into LEU. Initially, this program is projected to be on a small scale in the USA, but ultimately, the HEU is scheduled for conversion and blending at a commercial-scale plant planned for construction in Russia. The NFS plant in Erwin, Tennessee, is licensed to process HEU and has a small-capacity production line to convert metallic uranium into usable uranium compounds. This preliminary agreement by Allied and NFS also may fit into the plans envisioned in the inter-government agreement.

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FEASIBILITY

While there are many obstacles to the implementation of the US-Russian HEU conversion agreement, including non-proliferation concerns, environmental regulations, and transportation issues, the most obvious step that must occur to achieve success is the physical transformation of HEU to LEU; HEU is defined as uranium enriched to 20.0 weight-percent ($^{w}/_{o}$) ^{235}U, or greater. Weapons-grade HEU typically is enriched to 93-94 $^{w}/_{o}$ ^{235}U; this high level of enrichment, plus special mechanisms and geometry, are necessary to produce an explosive chain reaction. LEU is enriched to less than 20.0 $^{w}/_{o}$ ^{235}U, and most light water reactors typically use 2.0 $^{w}/_{o}$ to 5.0 $^{w}/_{o}$ material.

Enrichment Blending

The first and foremost challenge (assuming that the implementation contract is promptly concluded, signed, and approved by each government), is the need to convert the HEU metal to UF_6 or UO_2 and then blend it into LEU. Very limited capacity for converting HEU to LEU exists, and governments generally limit or prohibit intermingling of commercial-use uranium and weapons-use material, and keep the respective industries separate as well.

Uranium blending is the process that can make HEU usable in commercial reactors, and the basics of enrichment blending are the same, regardless if the initial material has an enrichment of 4.0 $^{w}/_{o}$ ^{235}U or 94.0 $^{w}/_{o}$ ^{235}U. In theory, enrichment blending is simply the combining of two batches of enriched uranium, each having different assays, to achieve the desired average product enrichment. For instance, as shown in **Example 1**, blending 10 MTU of 3.4 $^{w}/_{o}$ ^{235}U with 10 MTU of 3.6 $^{w}/_{o}$ ^{235}U will yield 20 MTU of 3.5 $^{w}/_{o}$ ^{235}U product. There is no loss of feed material, as the equivalent natural uranium contained in the blended product is the sum of the natural uranium necessary to create the ingredients (no uranium atoms are lost). However, blending is conceptually the opposite of the enrichment (or separation) process, and some SWU are lost in the blending process.

While it would seem inefficient to waste SWU, the losses from blending LEU are usually small, and the cost may be insignificant compared to the benefits. In the example, SWU lost by blending represent only about 0.01 percent of the SWU contained in the input batches. Moreover, to say SWU are "lost" in the dilution process could be misleading. It is less efficient to enrich uranium to a high level and bring it back down to a low level, than to enrich it to the low level initially. The SWU "loss" is a measure of this inefficiency.

Example 1
BASIC LEU ENRICHMENT BLENDING

In Units of Enriched UF_6 (UF_6e)

Quantity A	+	**Quantity B**	=	**Product**
10,000 kgU [as UF_6e] @ 3.40 $^{w}/_{o}$	+	10,000 kgU [as UF_6e] @ 3.60 $^{w}/_{o}$	=	20,000 kgU [as UF_6e] @ 3.50 $^{w}/_{o}$
Equivalent to*		**Equivalent to***		**Equivalent to***
75,430 kgU feed 41,540 SWU		80,290 kgU feed 45,250 SWU		155,720 kgU feed 86,780 SWU

Net feed gain/loss = (75,430 + 80,290) – 155,720 = 0

Net SWU gain/loss = (41,540 + 45,250) – 86,780 = –10

Percentage SWU loss = [10 ÷ (41,540 + 45,250)] × 100% = 0.01152%

* @ 0.3 $^{w}/_{o}$ ^{235}U tails assay

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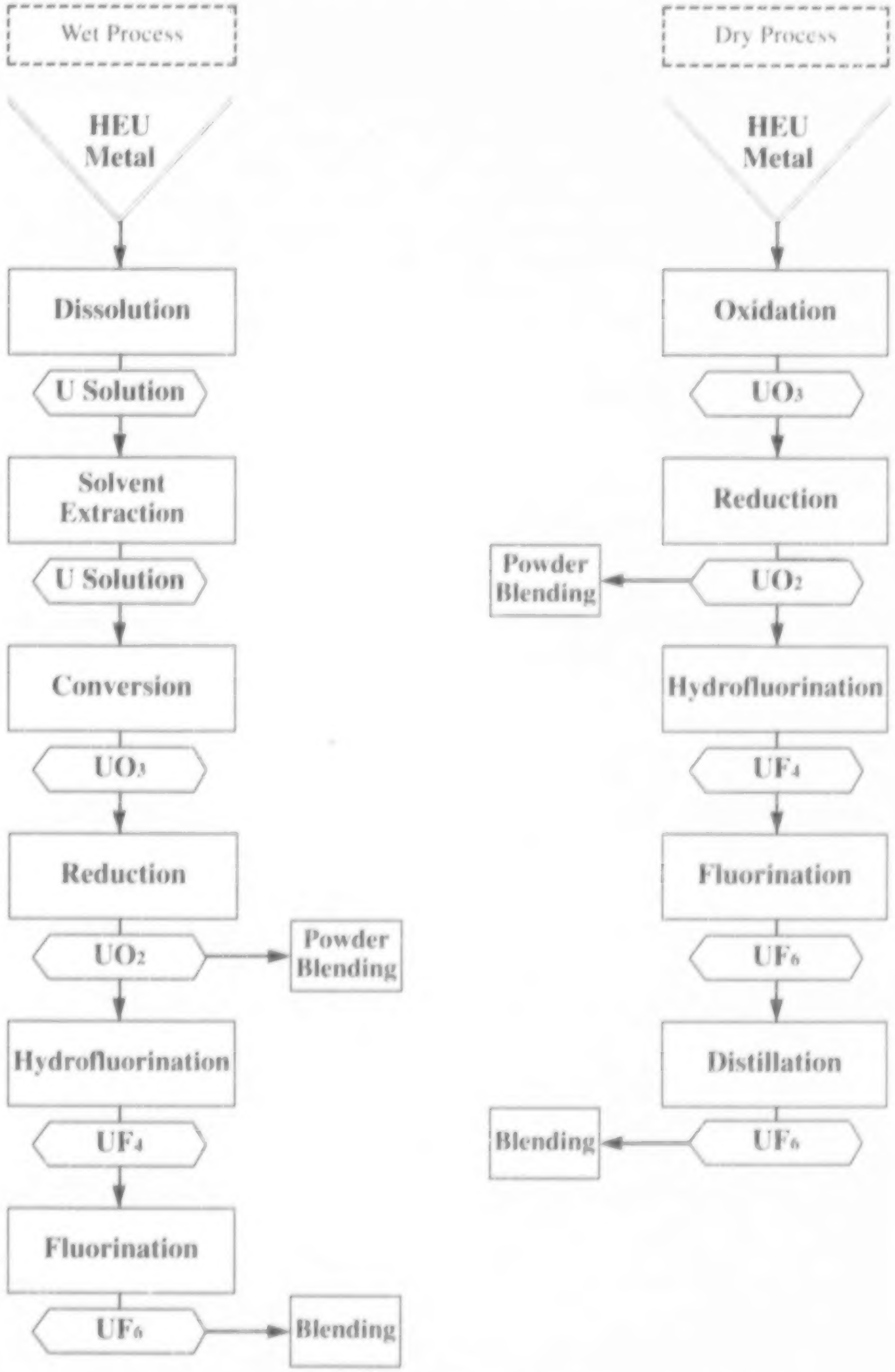
Figure 1
CONVERTING HIGHLY ENRICHED URANIUM METAL


Wet Process
HEU Metal
Dissolution
U Solution
Solvent Extraction
U Solution
Conversion
UO_3
Reduction
UO_2
Powder Blending
Hydrofluorination
UF_4
Fluorination
UF_6
Blending
Dry Process
HEU Metal
Oxidation
UO_3
Reduction
UO_2
Powder Blending
Hydrofluorination
UF_4
Fluorination
UF_6
Distillation
UF_6
Blending

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Blending losses depend upon the difference between the ingredient enrichment levels. A small difference (e.g., 0.2 $^{w}/_{o}$ ^{235}U when blending 3.4 $^{w}/_{o}$ ^{235}U material with 3.6 $^{w}/_{o}$ ^{235}U material) yields only a small SWU loss. The larger the difference between the two input materials, the higher the percentage loss. This is due to the logarithmic relationship governing the amount of additional SWU required to enrich uranium to the next incremental level. Thus, when blending down (diluting) HEU to LEU, SWU losses can be large; however, SWU losses from blending should be considered in terms of the relative cost of enriching material to the required design level. That is, although there will be some SWU "lost" during blending, the extra SWU contained in the higher level material can be considered a sunk cost, and therefore, blending may offer an economic means of generating LEU at the desired assay.

HEU Blending

Highly-enriched uranium is fabricated as U metal; to dilute HEU to a usable form of LEU, the HEU metal must first be converted to UF_6 or UO_2 using a wet or dry process (**Figure 1**). Assuming UF_6 is the desired product, the dry process involves oxidation and reduction to UO_2, and then fluorination. This is the technology Allied plans to provide to Russia in its joint venture with NFS. The wet process involves dissolution, solvent extraction, conversion, and reduction to UO_2, followed by hydrofluorination and fluorination, to produce UF_6.

After converting from U metal, the resultant highly enriched UF_6 or UO_2 then must be blended down to usable LEU. The dilutants can be natural uranium, depleted uranium tails, reprocessed uranium, or other LEU in the form of UF_6 or UO_2. Once blended, the LEU can be introduced into the fuel fabrication process.

Example 2 presents the basic calculations used when blending HEU. The HEU is assumed to have a 94.0 $^{w}/_{o}$ ^{235}U enrichment level, and natural uranium is assumed as the dilutant. For the sake of simplicity in this discussion, process losses are considered to be zero. In reality, however, process losses do occur when converting U metal to UF_6 or UO_2, and also during the blending process. The feed and SWU losses that would be created when blending the HEU purchased from Russia are shown

Example 2
HEU BLENDING WITH NATURAL URANIUM

In Units of Enriched UF_6 (UF_6e)

HEU	+	Dilutant	=	Product
1.0 kg [HEU]	+	**n** kg of dilutant	=	(1+**n**) kg of product
1.0 kg @ 94.0 $^{w}/_{o}$ [HEU]	+	**n** kg @ 0.711 $^{w}/_{o}$ [Natural U]	=	(1+**n**) kg @ 4.0 $^{w}/_{o}$ [LEU]
(1.0 kg × 0.94)	+	(**n** × 0.00711)	=	(1+**n**) × 0.04
		0.94 + 0.00711 **n**	=	0.04 + 0.04 **n**
		(0.04 – 0.00711)**n**	=	0.94 – 0.04
		n	=	0.90 ÷ 0.03289
		n	=	27.3639 kg [natural U dilutant]
		n + 1	=	28.3639 kg @ 4.0 $^{w}/_{o}$ [LEU]

That is, blending one kilogram of 94.0 $^{w}/_{o}$ HEU with 27.3639 kilograms of natural uranium yields 28.3639 kilograms of 4.0 $^{w}/_{o}$ LEU. From this relationship, the natural uranium dilutant required and the product yielded from any amount of 94.0 $^{w}/_{o}$ HEU can be determined. In the recent agreement, ten metric tons of HEU (10,000 kg) will be converted annually for the first five years.
Thus,

10,000 kg @ 94.0 $^{w}/_{o}$ [HEU] + 273,639 kg [natural U] = **283,639 kg @ 4.0 $^{w}/_{o}$** [LEU]

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in **Examples 3** and **4**. While there are no theoretical feed losses, the SWU lost are significant, totalling more than 500 thousand SWU for each 10 metric tons of 94.0 w/o HEU.

Adequate Capacity

Since there are no commercial-scale facilities in the USA to convert HEU metal, the availability of conversion and blending capacity is the most obvious hurdle to be overcome. Whether a plant is built in the USA or Russia, new capacity must be constructed for transforming metallic HEU and blending the resultant highly enriched UF_6 or UO_2. The needed technology is already proven, so no additional research and development is necessary to develop process specifications. However, several technical problems must be considered in converting HEU, such as de-coating and chopping of metallic uranium prior to treatment. Since metallic uranium is flammable, this operation may have to be performed in an inert gas environment.

Two US facilities—one owned by NFS, and the other by Babcock & Wilcox Naval Division—are licensed to process HEU, and the NFS plant can convert metallic uranium to usable uranium compounds in small quantities. DOE also has a small-capacity reprocessing plant at its Idaho National Engineering Laboratories that processes spent HEU fuel from nuclear submarines, but it is not suited for this type of HEU conversion and blending. The NFS plant would require substantial modification to be able to convert and dilute HEU metal to usable LEU on a commercial-scale, and probably would need to have its license amended accordingly.

Capital costs of a large-capacity HEU metal conversion plant (250 MT of HEU annually) have been estimated to exceed US$300 million, and for a similar-sized dilution facility, US$150 million. For smaller facilities that would more closely match the projected 30 MT-per-year import level, the costs would be approximately one-third as much. In any case, five years may be required for construction, and perhaps much longer, depending on the rate of approval of environmental impact statements, licensing, and other regulatory requirements.

Example 3
FEED LOSSES DURING THE HEU BLENDING PROCESS

From standard enrichment tables for **4.0** w/o ^{235}U product assay, and **0.30** w/o tails assay, **283,639** kg of **4.0** w/o material would contain:

2,553,318 kgU of equivalent natural U feed, and
1,496,479 SWU

For comparison, the feed content of **10** metric tons of **94.0** w/o HEU is:

2,279,810 kgU as UF_6.

As shown in the result in *Example 2*, to produce **283,639** kg of **4.0** w/o LEU from **10** MT of **94.0** w/o HEU requires:

273,639 kgU of natural uranium dilutant.

Thus, the total feed content is:

2,279,810 kgU to enrich to HEU
+ **273,639** kgU to dilute to LEU
2,553,449 kgU to enrich and then dilute

As can be seen by comparing the two total feed requirement results, there is no theoretical loss of feed during the blending process. (The differences shown here are attributable to rounding errors introduced during the calculations.)

- **2,553,449** kgU to enrich to HEU, then dilute to LEU
- **2,553,318** kgU to enrich directly to LEU

Example 4
SWU LOSSES DURING THE HEU BLENDING PROCESS

From standard enrichment tables for **4.0** $^{w}/_{o}$ ^{235}U product assay, and **0.30** $^{w}/_{o}$ tails assay, **283,639** kg of **4.0** $^{w}/_{o}$ material would contain:

2,553,318 kgU of equivalent natural U feed, and
1,496,479 SWU

For comparison, the SWU required to produce **10** metric tons of **94.0** $^{w}/_{o}$ HEU is:

2,023,840 SWU

Therefore, blending down **10** metric tons of **94.0** $^{w}/_{o}$ HEU to **4.0** $^{w}/_{o}$ LEU, leads to a loss of **527,361** SWU.

2,023,840 SWU contained in 94.0 $^{w}/_{o}$ HEU
− 1,496,479 SWU contained in 4.0 $^{w}/_{o}$ LEU
527,361 SWU "lost" in the dilution process

"Value" of the lost SWU at current spot prices:

527,361 SWU lost × **$66.00** per SWU **= $34,805,826**
283,639 kgU of 4.0 $^{w}/_{o}$ LEU **× $567** per kg **= $160,823,310** (total value of LEU)

[$34,805,826 ÷ $160,823,310] × 100% **= 21.6%** (percent of total value of LEU)

However, this "lost" SWU from the HEU can arguably be considered to have zero value, since the SWU is neither recoverable nor marketable.

Transportation

Transportation of the HEU could be another obstacle. Presently, the US Nuclear Regulatory Commission (NRC) limits the safe, secure transport of HEU to five kilograms per shipment. However, the NRC is reviewing this policy, and changes to the regulations to allow greater transport quantities and/or more frequent deliveries could be implemented relatively easily. Furthermore, while the USA transports much of its weapons-grade material by air, Russia primarily uses its railways for transport. Therefore the time required to dismantle warheads in Russia could be prolonged, since each warhead must be disarmed, crated in a special container, and moved by rail to one of twenty preliminary storage sites in the Ural mountains. The HEU would be extracted, and further transported to another site for storage. Although this extensive transport is not prohibitive, it could delay the rate at which the HEU becomes available to DOE.

Safeguards

International Atomic Energy Agency (IAEA) safeguards regulate all LEU material and facilities, and the agency's Department of Safeguards is the primary organization responsible for preventing the proliferation of nuclear weapons. Through its regular monitoring of facility inspections, material accounting, and information collection and analysis, the IAEA tracks all nuclear material and equipment to ensure its non-military use. The IAEA inevitably will become involved in the HEU blending process, because uranium enriched (or blended down) to less than 20.0 $^{w}/_{o}$ ^{235}U is subject to safeguards, and must be disclosed by countries that have agreed to abide by IAEA guidelines. Proposals from both governments on how to implement the US-Russian agreement have supported active IAEA participation to ensure safeguarded storage and processing of the resultant LEU.

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Interim Storage

Another important issue is safe and secure interim storage of the HEU prior to its conversion and dilution. The present agreement envisions at least a 20-year program before the present HEU quantities are processed. Thus, a maximum-security facility, subject to both national and international safeguards, must be established. The challenges of implementing mutual inspections and controlling national security probably will be discussed as part of the upcoming negotiations on the implementing contract.

Licensing

Any existing facility in the USA being modified to process HEU on a commercial scale likely will require a new or amended operating license. This could present further delays in converting the Russian HEU into usable nuclear fuel.

Environmental Concerns

Environmental issues will affect virtually every stage of the conversion and blending processes. Transportation of HEU already has been raised as an issue of environmental concern, particularly regarding potential accidents. Any significant expansion of metallic uranium conversion facilities in the USA probably will require a full environmental impact statement, which could take one or two years for complete review and approval. Also, since process losses and wastes are a manufacturing reality when converting and blending HEU, disposition of these wastes becomes another issue to be solved. Most of the environmental concerns are essentially the same as those existing for long-term storage or disposal of nuclear waste, including spent fuel and other by-products. Once the USA and other countries resolve their waste disposal problems, most of the primary environmental concerns regarding the dilution of HEU will have been addressed.

MARKET IMPLICATIONS

How and when uranium from dismantled weapons would affect the market is the major question many industry participants are asking. To give perspective to the situation, here are some of the factors affecting that question.

- At least 500 metric tons of HEU from Russia could be made available over the next 20 years—five years at 10 MTU per year, and 15 years at 30 MTU per year.
- As shown in Example 2, if 10 metric tons of 94.0 w/o HEU were converted and blended to 4.0 w/o LEU, it would yield 284 metric tons of LEU.
- Projected world and US average annual natural uranium requirements for the period 1994 through 2000 are:

  Forecast annual world requirements = 162 million lbs U_3O_8
  Forecast annual US requirements = 45 million lbs U_3O_8
- If all the requirements were 4.0 w/o LEU, they would equal:

  Forecast annual world requirements = 6,887 MT 4.0 w/o LEU
  Forecast annual US requirements = 1,913 MT 4.0 w/o LEU

Therefore, for the first five years the HEU is converted and made available as commercial nuclear fuel, it could fill four percent of world requirements, or more than 14 percent of US requirements. If the HEU quantity being sold by Russia reaches the targeted 30 metric tons per year, it could eventually supply as much as 12 percent of world requirements or 44 percent of US requirements. Assuming DOE's annual production is 11 million SWU, this higher level of HEU would displace approximately 40 percent of its production, and bring DOE's total production down to roughly 6.5 million SWU—low enough to close a GDP.

At current spot market prices, the value of UF_6 at 4.0 w/o ^{235}U is $567 per kilogram. With the NUEXCO SWU Value for enrichment services equalling $66 per SWU, the SWU lost during HEU dilution theoretically could account for more than 21 percent of the value of the LEU material. However, assigning a value to the SWU "lost"

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during the HEU blending process is debatable, since there is no commercial market for HEU. Only the SWU contained in the LEU have any commercial value; therefore any SWU contained in HEU in excess of what is marketable as LEU, is not recoverable and effectively has no value. Thus, the value of HEU is tied to its value when converted and used as LEU, and should be evaluated accordingly.

The cost of LEU produced from HEU has two primary components: the costs incurred while converting and blending the HEU metal (including dilutant); and the purchase price for the HEU. The operational costs of blending are unavoidable and will be incurred relative to the quantity of HEU blended. Therefore, the price paid for the HEU can significantly affect the economics of the process.

However, the cost of originally producing the HEU can be considered a sunk cost. In order to have favorable economics, the incremental cost of producing LEU via dilution must be less than DOE's incremental cost of producing LEU directly from natural uranium. Further, DOE can realize significant cost savings in three ways. First, by feeding the LEU into its customer contracts, DOE can reduce its production costs at its enrichment plants by lowering its production levels, thus avoiding higher-priced, fixed-power electricity contracts. These savings could become particularly meaningful after 1995, when regulatory requirements dictated by the Clean Air Act will significantly increase electricity costs at DOE's dated gaseous diffusion plants.

Secondly, since DOE already has uncommitted capacity at its enrichment plants, it also could shut down one of its GDPs, resulting in further cost savings. Additionally, since its customers will continue to deliver the full amount of uranium feed dictated by their enrichment services contract, DOE could derive more savings by continuing or expanding its present overfeeding program, thereby lowering its production costs further and making it more competitive.

Having an even greater effect will be the timing of when the material reaches the market through DOE. Optimistically, an implementing contract could be signed in 1993, thereby permitting HEU to be delivered as early as 1994 (assuming sufficient quantities can be physically recovered from dismantled weapons by that time, and that the material can be safely and securely transported). Given the present level of conversion and blending capacity, the first small quantities of LEU could, theoretically, be ready by late 1995. However, delays can reasonably be expected due to licensing, transportation, and conversion issues, and at the earliest, material could be ready for DOE customers in 1996 or 1997. Further, if new facilities are constructed and full environmental impact statements and new license approvals are required, it may be five or more years before conversion of significant quantities could even begin. Therefore, realistically, it will be at least the latter part of this decade before the first significant quantities reach the market.

CONCLUSION

The dismantlement of nuclear weapons and the conversion and use of the HEU for peaceful purposes are major steps forward for the world. HEU can be blended down into usable fuel for commercial nuclear reactors; while some losses occur in the process, it can be economically viable. However, whether or not the economics of the process are attractive, the program is likely to proceed because of its enormous socio-political significance and weapons-reduction implications. It is up to US and Russian negotiators to determine what HEU price level will provide an appropriate economic incentive to DOE and still bring an acceptable economic benefit to Russia. Several obstacles may slow the progress of this landmark US-Russian agreement, including inadequate conversion capacity, transportation issues, safeguards requirements, licensing approvals, and environmental concerns, but all of these can be overcome.

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TAIWAN'S NUCLEAR PROGRAM

BACKGROUND

The Republic of China, more commonly known as Taiwan, is one of the newly industrialized countries of Asia and has been called one of its four "economic tigers" (along with South Korea, Hong Kong, and Singapore). The island nation of Taiwan is located approximately 100 miles off the southeast coast of mainland China, between Japan and the Philippines, and covers 13,970 square miles (slightly smaller than Switzerland). It has a population exceeding 20 million people, with almost five million living in the capital of Taipei, making Taiwan the second most densely populated country in the world. Taiwan has one of the world's most rapidly growing economies; major industries include electronics, textiles, food processing, chemicals, and plastics. Annual growth of Taiwan's gross national product (GNP) has averaged more than seven percent for the past four years and the country is now the twelfth largest trading nation in the world, with a GNP exceeding US$150 billion.

Taiwan presently relies on nuclear power to supply more than one-third of its electricity requirements. The country operates six reactors at three stations with a total net capacity of 4,842 MWe (**Figure 1**), and the government recently approved plans for construction of a fourth nuclear power station.

Figure 1 — Chinshan Nuclear Power Station. Taiwan's first nuclear station contains twin 604-MWe BWRs. *(Photo courtesy of Taipower)*

ENERGY SITUATION

With Taiwan's rapid industrialization comes a growing demand for energy. Since the country has limited natural resources, it must import most of its energy supplies. Imported oil and natural gas contribute more than half the country's total energy supply; coal, both imported and domestic, contributes about 26 percent. Nuclear power provides 14 percent of the total energy supply, and hydroelectric power, the remaining eight percent.

Electricity Supply

The state-owned utility, Taiwan Power Company (Taipower), is striving to keep up with rapid growth in electricity demand. Peak load demand has grown at the astounding rate of more than ten percent annually almost every year since the mid-1980s. Taipower was able to maintain a reserve margin exceeding 40 percent until a few years ago, but that figure has now dropped to less than ten percent. Taipower's total generating capacity presently equals 17.12GW, and peak demand near the end of July 1992 reached 16.45 GW. Blackouts and brownouts occurred during 1991, and capacity reserve reached a record low of only 4.8 percent. Taipower is concerned that with such small reserves, shortages could recur if any two major generating stations experience outages simultaneously.

To meet the growing power demand, Taipower plans to add 19 thousand MWe of capacity in the upcoming decade. The company currently is in the midst of an aggressive power plant construction program to meet immediate demand. It has moved up scheduled completion dates of oil-, natural gas-, and coal-fired plants under construction and in the planning stage. Within the last two years, Taipower has started up a 327-MWe oil-fired plant at Taichung, and a combined-cycle (oil/gas) plant at Tunghsiao. The utility plans to continue to rely on fossil-fuels, particularly liquid natural gas (LNG), for most of its new generating capacity. Of the country's planned new capacity additions, only 10-15 percent will be new nuclear capacity, primarily because Taipower wishes to maintain a diversified capacity base and because the country's well-organized anti-nuclear opposition makes siting new nuclear plants difficult. Nevertheless, due to the increased power demand, the importance of nuclear energy has become more evident than ever, and the need for the country's seventh and eighth reactors at a fourth station has become great enough to overcome political opposition.

NUCLEAR POWER PROGRAM

Operating Stations

Taipower currently operates six nuclear power units—four boiling water reactors and two pressurized water reactors—located at three stations, with a total net capacity of 4,842 MWe (**Table 1**). Kuosheng and Chinshan stations in northern Taiwan each contain two BWR units (**Figure 2**), and the Maanshan station on the southern tip of the country contains two PWRs. The country's nuclear stations generated 33,496 GWh in 1991, with an average capacity factor of 79 percent. The power generated by the six reactors contributed 37.8 percent of Taiwan's total electricity in 1991. Nuclear generating capacity accounts for approximately 30 percent of total capacity, a ratio that Taipower wishes to maintain as its overall generation capacity expands.

Taipower conducted feasibility studies for the country's first nuclear plants in 1967 and 1968. Construction began on the nation's first station in June 1972; the twin 604-MWe BWRs at Chinshan were supplied by General Electric and utilized GE's Mark I containment. Chinshan 1 and 2 began commercial operation in 1978 and 1979, respectively. Both reactors have operated fairly well and the plants' average annual capacity factors have often exceeded 70 percent, with Chinshan 1 achieving an 83 percent capacity factor in 1991.

Table 1
NUCLEAR POWER UNITS IN TAIWAN

Units In Operation

Unit	Lead Utility or Fuel Buyer	Capacity (MWe net)	Type	COD [1]	1991 Capacity Factor (percent)	Total 1991 Electricity Generation (GWh net)
Chinshan 1	Taipower [2]	604	BWR	1978	83	4,403
Chinshan 2	Taipower	604	BWR	1979	72	3,797
Kuosheng 1	Taipower	918	BWR	1981	72	5,786
Kuosheng 2	Taipower	936	BWR	1983	87	7,120
Maanshan 1	Taipower	890	PWR	1984	81	6,341
Maanshan 2	Taipower	890	PWR	1985	78	6,048
TOTAL		**4,842**		*(1991 Average:*	**79)**	**33,496**

Units Planned

Unit	Lead Utility or Fuel Buyer	Capacity (est. MWe net)	Type	COD [1]
Yenliao 1	Taipower	1,150	LWR [3]	2000
Yenliao 2	Taipower	1,150	LWR	2001
TOTAL		**2,300**		

[1] COD = Commercial Operation Date (actual or expected)
[2] Taipower = Taiwan Power Corporation
[3] LWR = Light Water Reactor

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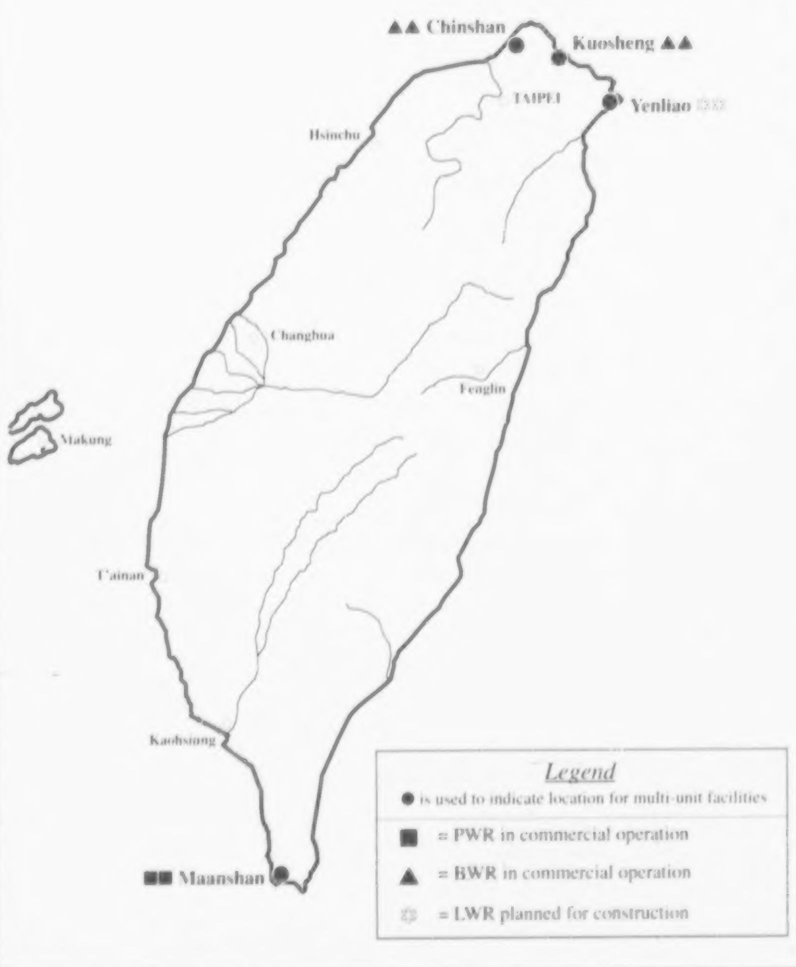
Figure 2
NUCLEAR POWER UNITS IN TAIWAN


▲▲ Chinshan
Kuosheng ▲▲
TAIPEI
Yenliao
Hsinchu
Changhua
Fenglin
Makung
Tainan
Kaohsiung
■■ Maanshan
Legend
● is used to indicate location for multi-unit facilities
■ = PWR in commercial operation
▲ = BWR in commercial operation
= LWR planned for construction

Taiwan's second nuclear power station was built at Kuosheng (**Figure 3**). Both reactors once again were supplied by GE; the reactors featured Mark III containment. After beginning construction in November 1975, Unit 1 (a 918-MWe BWR) was declared in commercial operation in late 1981, and Unit 2 (a 936-MWe BWR) went commercial in March 1983. This station also has performed quite well, with a capacity factor averaging more than 78 percent the past two years.

Construction on the country's third station at Maanshan began in August 1978. The 890-MWe PWRs were supplied by Westinghouse and represented Taiwan's fifth and sixth reactors. Maanshan 1 began commercial operation in 1984 and Maanshan 2, in 1985 (**Figure 4**). While performance was lackluster the first few years, recent operation has been quite good, with capacity factors near 80 percent. Each unit produced approximately 6,000 GWh in 1991.

Planned Fourth Station

While Taiwan currently faces growing electricity demand and a low capacity reserve, ironically, slower-than-expected economic and electricity demand growth in 1981 and 1982, led the government to stop plans in June 1982 for construction of a fourth nuclear station at Yenliao. Taipower had already evaluated offers from several suppliers and was negotiating with Combustion Engineering Inc. for two 950-MWe PWRs when the plans were halted.

Increased demand for electricity and rapid economic growth resumed by the mid-1980s, but by that time, strong anti-nuclear opposition had begun to emerge, and public acceptance of nuclear power was quite low as a result of the Chernobyl accident in 1986. Thus, proposals to restart the process of building the fourth station were repeatedly unsuccessful. In fact, in 1986, in the backlash of the Chernobyl accident, the Legislative Yuan froze pre-construction funds (US$316 million) that were earmarked for the Yenliao station, thereby preventing any forward movement on the project.

Not until this past year have conditions been conducive to renew efforts to build the fourth station: the Executive Yuan (cabinet) supports nuclear power; demand for

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Figure 3 — Kuosheng Nuclear Power Station. Taiwan's second nuclear power station, which began operation in 1981. *(Photo courtesy of Taipower)*

electricity remains very strong; energy shortages are imminent unless additional capacity is added; and the public relations effort exerted by Taipower over the past few years to increase public understanding and acceptance of nuclear power has had some success. As the need for the fourth station became undeniable and public acceptance increased, the proposal to resume plans for the country's seventh and eighth reactors gained the government support necessary to receive approval for the project. As a result, after receiving approvals from the Ministry of Economic Affairs (MOEA) and the Executive Yuan, the budget committee of the Legislative Yuan voted 5 to 3 on June 3, 1992, to release the pre-construction funds for the Yenliao station that had been frozen in 1986. An Environmental Impact Assessment Report on the station is being evaluated by Taiwan's Atomic Energy Council, and a comprehensive safety report is being prepared by the MOEA.

The proposed station will be built on the Yenliao peninsula, near the village of Kungliao, in northeastern Taiwan. The timeline in **Table 2** shows the historical development of the project and its planned construction schedule. Taipower already has solicited offers to select the architect/engineer for the project, and bid invitations for the nuclear steam supply systems and the turbine generators are planned for release near the end of this year. Four primary bidders are expected for the nuclear island. They include Asea Brown Boveri/Combustion Engineering with its System 80+ PWR; General Electric with an advanced BWR (developed in conjunction with Hitachi and Toshiba); Westinghouse with an advanced PWR (with Mitsubishi); and Nuclear Power International, the joint-venture between Framatome and Siemens, with a PWR. Offers will be due during the first half of 1993. The project will be bid for two 1,000-1,300 MWe (gross) units, with a possible option for two more units at the same site. **Figure 5** is an artist's depiction of the new station. Once all approvals have been received— for example, safety and environmental impact—construction is scheduled to begin in 1995, with commercial operation of Yenliao 1 planned for the year 2000 and Unit 2, one year later.

Figure 4 — Maanshan Nuclear Power Station Control Room. *(Photo courtesy of Taipower)*

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TABLE 2
TIMELINE FOR TAIWAN'S FOURTH NUCLEAR STATION

June 1982	Dip in projected power demand leads the government to stop negotiations with Combustion Engineering on the country's fourth nuclear power station. All plans for the two-unit (950 MWe each) station are postponed.
Mid- to Late-1980s	Authorities try several times to restart the project, but a growing anti-nuclear lobby and the backlash of public opinion as a result of the Chernobyl accident prevent its revival.
Nov. 1991	As part of its new, six-year national economic plan, the Taiwan government announces a NT$300 billion plan for infrastructure improvements, and states that likely projects include the country's seventh and eighth nuclear units.
Jan. 1992	Feasibility study conducted by Commission on National Corporations (CNC) is released; it concludes that construction of the fourth nuclear power station should proceed. The CNC is the government agency beneath the Ministry of Economic Affairs that is directly responsible for supervising the state-owned utility, Taiwan Power Company (Taipower).
Feb.	Ministry of Economic Affairs (MOEA) endorses findings of the CNC and forwards the plans to the Executive Yuan (cabinet) for action.
	Executive Yuan quickly approves the plans for construction of the fourth station at Yenliao in which the country's seventh and eighth reactors would be located.
—	Atomic Energy Council (AEC) accepts the Environmental Impact Assessment Report on the station from the MOEA. The AEC is expected to take at least six months to evaluate the report. The MOEA also begins the estimated year-long process of preparing a safety report on the station to submit to the AEC. Once submitted, the safety report is expected to take another year for review and approval.
May	Amid anti-nuclear protests from the minority, the Legislative Yuan votes to allow the budget committee to decide on the release of the frozen pre-construction funds.
June	Budget committee of Legislative Yuan votes to release US$316 million in pre-construction funds for the station frozen since 1986.
July	Taipower issues bid invitations for project's architect-engineer company.
Dec	Taipower expected to issue bid invitations for the nuclear steam supply system (NSSS) and turbine generators.
1st Half 1993	Offers due for NSSS and turbine generators.
2nd Half	Contracts awarded for NSSS and turbines.
3rd Quarter 1995	Construction of Yenliao station begins.
3rd Quarter 2000	First unit scheduled to begin commercial operation.
3rd Quarter 2001	Second unit scheduled to begin commercial operation.

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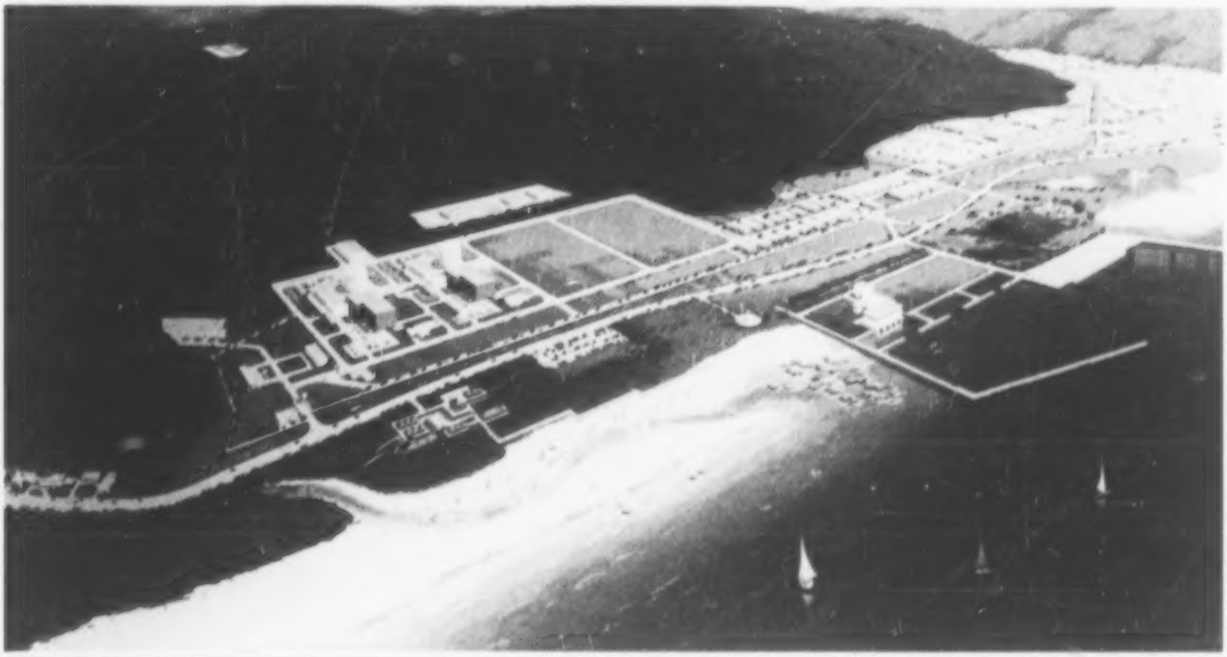

Figure 5 — Artist's Conception of Planned Yenliao Nuclear Power Station. *(Photo courtesy of Taipower)*

Future Plans

With Taiwan's low capacity reserve and an annual growth in electrical demand consistently near ten percent, clearly Taipower needs to add a significant amount of new generating capacity. Current plans call for total capacity to nearly double within the next ten years: 19 thousand megawatts of capacity will be added. Of this, approximately 15 thousand megawatts will be fossil-fueled capacity (primarily coal and LNG); two thousand will be hydroelectric capacity; and two thousand will be nuclear power (Yenliao station). Taipower would like to increase nuclear power's relative contribution to total installed generating capacity, although there is strong public opposition to significant nuclear expansion. In addition to the two new reactors at Yenliao, and a possible option to build two more units at that location, Taipower is considering adding additional units at the existing stations. This option was endorsed by Taiwan's Environmental Protection Administration as an alternative to locating new sites.

FUEL CYCLE

Facilities

Taiwan has not developed a complete fuel cycle industry to support its nuclear program and obtains nearly all of its required fuel and fuel cycle services from other countries. The country has no domestic uranium resources, so Taipower relies primarily on long-term supply contracts. The company has made an effort to enhance its security of supply position by participating in a uranium production joint-venture with Union Pacific Resources (UPR) of the USA, who owns properties in the Arizona Strip and in the Powder River Basin of Wyoming. UPR's uranium projects are all currently inactive, due to depressed market conditions.

Taiwan has, in the past, considered constructing a fuel fabrication facility, but still has not yet decided if and when to build. Given the addition of the country's seventh and eighth reactors, the economics of a domestic fabrication facility have improved. Taipower estimates that a decision regarding a fuel factory will not be made until after the equipment required for the Yenliao station has been ordered, likely around 1995 or 1996. The fabrication plant would need to handle both BWR and PWR fuel, with one pellet line and separate fuel rod and bundle assembly lines.

Taiwan's only fuel-cycle facility is a low-level radioactive waste disposal site (**Figure 6**) located on Lan-Yu Island, about 50 miles east of the southern tip of Taiwan. This facility, which is operated by Taipower, began service in the early 1980s and is expected to reach capacity in roughly eight years. Thus, Taiwan is looking at potential locations for new facilities. One possibility has received considerable attention from the press: this proposal has Taiwan and mainland China cooperating on building a new medium- and low-level waste facility on an island off the southeast coast of the mainland. Mainland China would provide the land required and Taiwan would build and fund the facility, with both countries having access to the disposal site. Both sides have emphasized, however, that discussions of this topic are still unofficial and only in preliminary stages. If the proposal moves forward, it will mark a milestone in the relations of the two governments, as well as their first cooperation in the nuclear field.

Contracting

Due to the lack of fuel cycle facilities, Taipower has, by necessity, purchased most of its fuel cycle needs abroad. Taipower buys most of its uranium under long-term contracts, primarily from Cogema of France and Rössing Uranium, Ltd. of Namibia, although it does follow the spot market and makes occasional purchases, if economically justified. The company cannot buy uranium from Canada or Australia, as Taiwan does not have bilateral safeguards with those countries, primarily due to the political recognition differences brought about by the existence of both Taiwan and mainland China.

For its conversion needs, Taipower purchases UF_6 from Cogema and has long-term contracts with US converters. The utility fills most of its enrichment requirements through long-term contracts with the US Department of Energy (DOE), with the balance supplied by Eurodif. Siemens Nuclear Power Corporation, General Electric, and Westinghouse provide all of Taipower's required fabrication services. The utility's reactors currently are operating under 18-month cycles, with one-third of the core typically replaced during each reload.

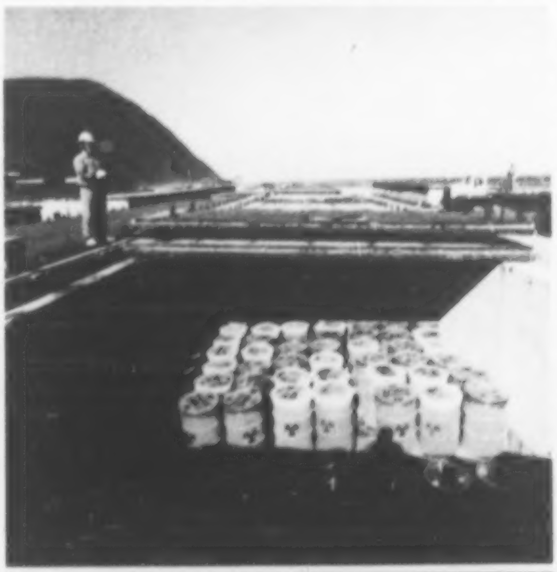

Figure 6 — Low-level waste disposal site on Lan-Yu Island. *(Photo courtesy of Taipower)*

Nuclear industry participants have been heartened by the possibility of a new facility in Taiwan. If the proposed station overcomes all of its political hurdles and reaches commercial operation by the turn of the century, it will provide new marketing opportunities for the world's fuel cycle companies. The planned 2,000-MWe station would consume millions of pounds of equivalent U_3O_8 (as well as related conversion, enrichment, and fabrication services) over its lifetime, with the first orders coming as early as 1995 or 1996.

CONCLUSION

Taiwan is expected to continue its rapid economic growth. With this growth comes increasing demand for electric power, and the government of Taiwan has recognized that nuclear power must play an important role in sustaining the country's economic expansion. Taipower is dedicated to providing the electricity needed by the country and plans to double installed generating capacity over the next decade, with new nuclear power capacity totalling at least 2,000 MW. While nuclear accounts for only ten percent of the planned capacity additions, as Taipower seeks to balance its supply sources and counter public opposition, it intends to maintain nuclear generating capacity at approximately 30 percent of total capacity. Taiwan will continue to support the nuclear expansion plans required to meet electricity demand, despite the well-organized opposition active in the country.

NUCLEAR INDUSTRY CALENDAR

1992	
Sept. 29- Oct. 1	***Crisis/Emergency Information Planners' Warkshop*** (Loews L'Enfant Plaza, Washington DC) Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113; Mail: 1776 "I" Street NW, Suite 400, Washington, DC 20006-3708.
Oct. 2-4	***IAEA/NEA International Seminar on Decommissioning Policies*** (Paris, France). Sponsored by the International Atomic Energy Agency and the OECD Nuclear Energy Agency. Contact: IAEA Conference Service Section, P. O. Box 100, A-1400 Vienna, Austria.
Oct. 11-16	***USCEA Training Seminar on the Fundamentals of Nuclear Power*** (Georgetown University Conference Center, Washington, DC). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office: 202-293-0770; Telex: 7108249602; Fax: 202-785-4113; Mail: 1776 "I" Street NW, Suite 400, Washington, DC 20006-3708.
Oct. 18-22	***AMC Mining Convention*** (Las Vegas, Nevada). Sponsored by the American Mining Congress. Contact: AMC Convention Office: 202-861-2800; Fax: 202-861-7535.
Oct. 19-23	***International Symposium on Geological Disposal of Spent Fuel, High-level and Alpha-bearing Wastes*** (Antwerp, Belgium). Sponsored by the International Atomic Energy Agency. Contact: IAEA Conference Service Section, P. O. Box 100, A-1400 Vienna, Austria.
Nov. 9-10	***Financial Times/Power in Europe World Electricity Conference*** (Hotel Inter-Continental, London, UK). Contact: FT Conferences; 071-925-2323; Fax: 071-925-2125; Mail: 126 Jermyn Street, London SW1Y 4UJ, United Kingdom.
Nov. 15-18	***International Nuclear Energy Forum "A Shrinking World, Expanding Horizons"*** (Fairmont Hotel, Chicago, Illinois). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113; Mail: 1776 "I" Street NW, Suite 400, Washington, DC 20006-3708.
Nov. 15-20	***American Nuclear Society Winter Meeting*** (McCormick Center Hotel, Chicago, Illinois). Contact: ANS Meetings Department; 708-352-6611.
Nov. 22-24	***2nd International Conference on CANDU Maintenance*** (Holiday Inn On King, Toronto, Canada). Sponsored by the Canadian Nuclear Association and Canadian Nuclear Society. Contact: CANDU Conference; 416-823-9040; Fax: 416-823-6120; Mail: 2251 Speakman Drive, Mississauga, Ontario, Canada L5K 1B2.

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NUCLEAR INDUSTRY CALENDAR

1993

Feb. 28- Mar. 3	***Nuclear Insurance Conference*** (Le Meridien at Coronado, San Diego, California). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office: 202-293-0770; Telex: 7108249602; Fax: 202-785-4113; Mail: 1776 "I" Street NW, Suite 400, Washington, DC 20006-3708.
Mar. 21-24	***Fuel Cycle Conference '93*** (Lowes Anatole Hotel, Dallas, Texas). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office: 202-293-0770; Telex: 7108249602; Fax: 202-785-4113; Mail: 1776 "I" Street NW, Suite 400, Washington, DC 20006-3708.
May 16-18	***INFO '93 Conference*** (Don Cesar Hotel, Tampa, Florida). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office: 202-293-0770; Telex: 7108249602; Fax: 202-785-4113; Mail: 1776 "I" Street NW, Suite 400, Washington, DC 20006-3708.
Sept. 28-30	***Crisis/Emergency Information Planner's Workshop*** (Westin William Penn Hotel, Pittsburg, Penn.). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office: 202-293-0770; Telex: 7108249602; Fax: 202-785-4113; Mail: 1776 "I" Street NW, Suite 400, Washington, DC 20006-3708.
Oct. 3-6	***Uranium Seminar '93*** (Westin La Paloma Hotel, Tucson, Arizona). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office: 202-293-0770; Telex: 7108249602; Fax: 202-785-4113; Mail: 1776 "I" Street NW, Suite 400, Washington, DC 20006-3708.
Oct. 3-7	***INC'93 (International Nuclear Congress and Exhibition) "Towards a Better Future"*** (Sheraton Centre, Toronto, Canada). Sponsored by the Canadian Nuclear Association and Canadian Nuclear Society. Contact: INC93 Conference: 416-823-9040; Fax: 416-823-6120; Mail: 2251 Speakman Drive, Mississauga, Ontario, Canada L5K 1B2.
Nov. 14-17	***Nuclear Energy Forum*** (Westin St. Francis Hotel, San Francisco, California). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office: 202-293-0770; Telex: 7108249602; Fax: 202-785-4113; Mail: 1776 "I" Street NW, Suite 400, Washington, DC 20006-3708.

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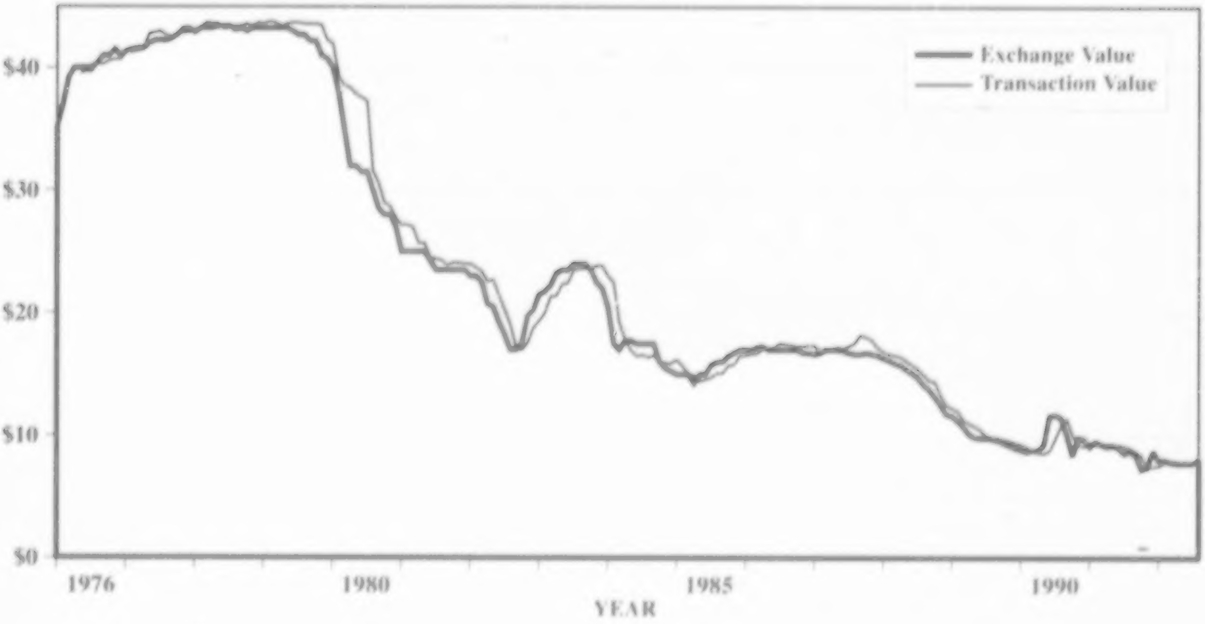
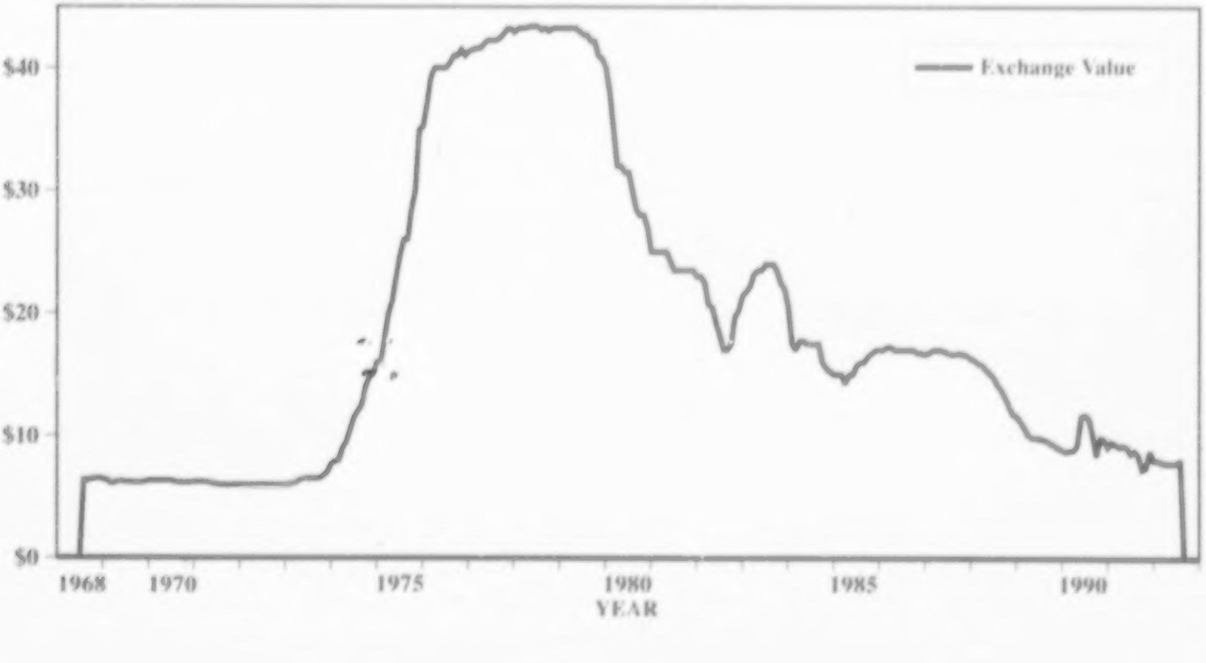
NUEXCO HISTORICAL EXCHANGE VALUE AND TRANSACTION VALUE

(in US dollars per pound U_3O_8)





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HISTORICAL MARKET VALUES

Exchange Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	9.80	9.70
1991	9.10	9.50	9.30	9.10	9.20	9.05	8.55	8.75	8.40	7.25	7.40	8.75
1992	8.00	8.00	7.85	7.75	7.75	7.75	7.75	**8.05**				

US Premium (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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UF_6 Values

	Determined as of the last day of the month indicated ($US/kg U as UF_6)											
Year	**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29.50	24.75	28.75	28.75
1991	27.50	27.75	27.50	27.25	27.60	27.25	25.75	26.25	25.50	22.75	22.75	26.00
1992	24.50	24.25	24.00	23.75	23.60	23.60	23.50	**24.25**				

US Premium (Relative to the UF_6 Value)

	Determined as of the last day of the month indicated ($US/kg U as UF_6)											
Year	**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

Conversion Values

	Determined as of the last day of the month indicated ($US/lb U as UF_6)											
Year	**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
1991	1.45	1.45	1.45	1.45	1.50	1.50	1.50	1.60	1.55	1.55	1.55	1.55
1992	1.60	1.60	1.60	1.60	1.60	1.50	1.50	**1.50**				

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HISTORICAL MARKET DATA

Transaction Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	9.30	9.15
1991	9.40	9.45	9.35	9.30	9.30	9.20	9.15	8.95	8.70	8.35	7.45	7.50
1992	7.55	7.80	7.95	7.90	7.85	7.80	7.75	**7.85**				

SWU Values

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	51	51
1991	51	50	52	52	54	59	66	67	67	68	68	70
1992	71	70	69	67	65	65	66	**66**				

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Loan Rates

Determined as of the last day of the month indicated (Percent per Annum)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1991	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.00
1992	3.00	3.00	3.00	3.00	3.00	3.00	3.00	**3.00**				

* Float with Prime Rate

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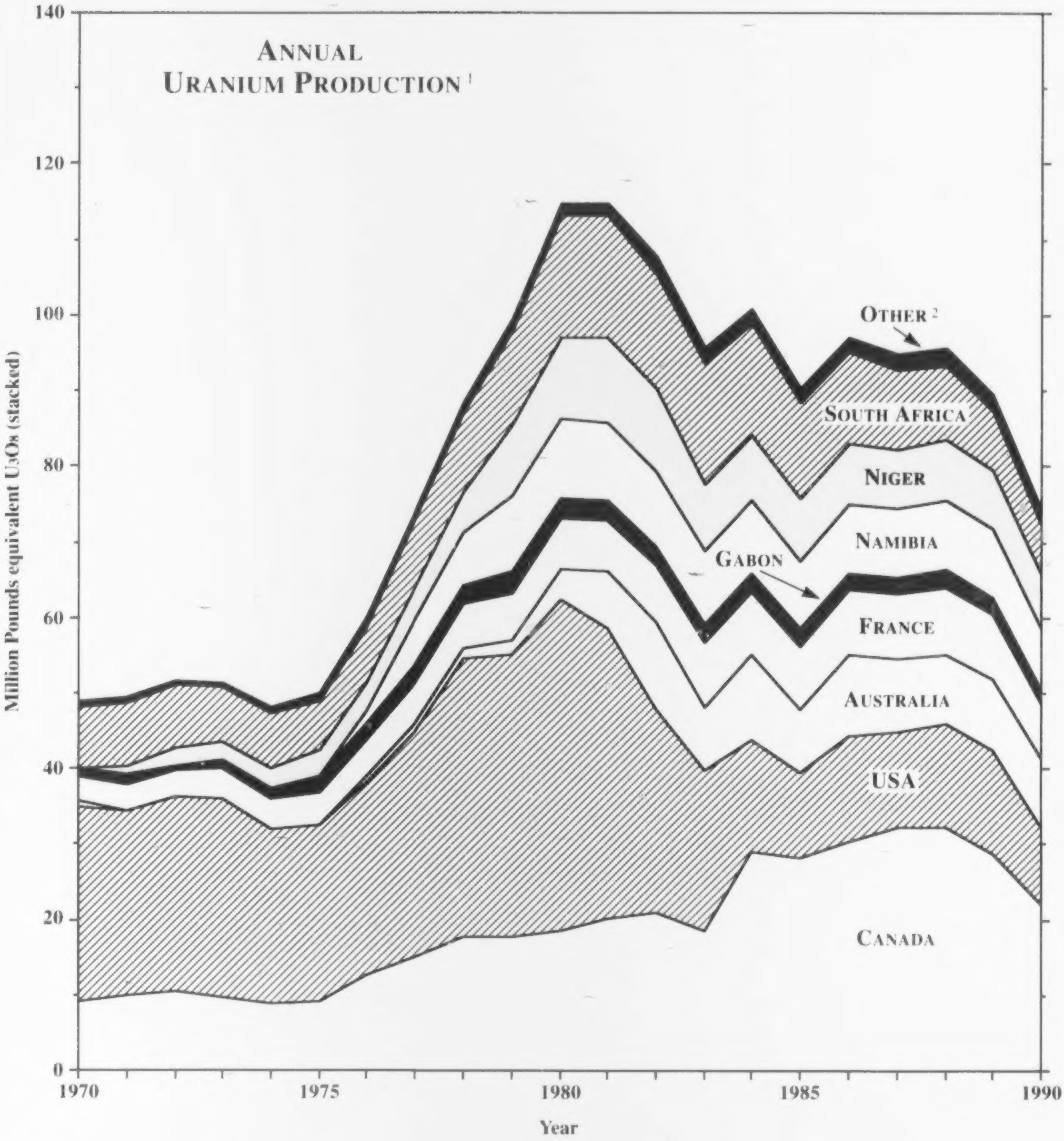

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[1] Estimated western world uranium production in 1990 totalled 74.5 million pounds equivalent U_3O_8 —
(Australia: 9.1 – Canada: 22.0 – France: 7.4 – Gabon: 1.8 – Namibia: 8.0 – Niger: 7.4 – South Africa: 6.4 – USA: 10.2 – Other[2]: 2.2)

[2] **Other** includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, former West Germany, and Yugoslavia (Slovenia)

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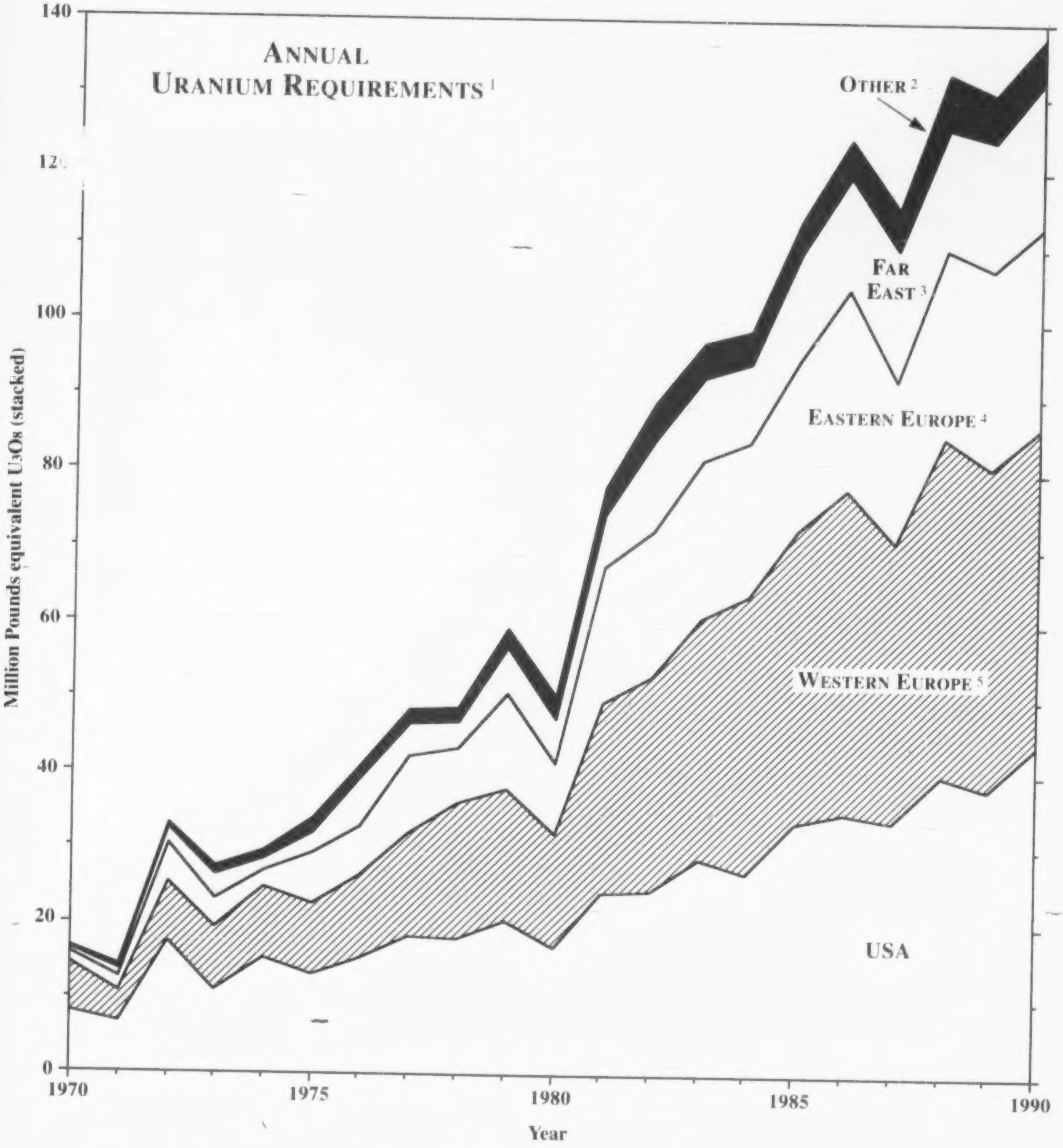

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[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assay.

[2] **Other** includes: Argentina, Brazil, Canada, India, Mexico, Pakistan, and South Africa.

[3] **Far East** includes: Japan, People's Republic of China, South Korea, and Taiwan.

[4] **Eastern Europe** includes: Bulgaria, Czechoslovakia, former East Germany, Finland, Hungary, former Soviet Union, and Yugoslavia (Slovenia).

[5] **Western Europe** includes: Belgium, France, former West Germany, Italy, The Netherlands, Spain, Sweden, Switzerland, and UK.

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Australia

Year	Period[1]	Consumer Price Index[2] (1989/1990 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia[5] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[4] (June 1985 = 100)
1980	Avg.	47.4	83.1	—	69.6
1981	Avg.	51.9	85.9	—	76.1
1982	Avg.	57.7	89.0	—	86.4
1983	Avg.	56.9	96.9	—	89.9
1984	Avg.	66.0	98.0	—	96.0
1985	Avg.	70.5	107.3	—	100.0
1986	Avg.	76.9	101.5	—	104.9
1987	Avg.	83.4	108.9	465.88	112.9
1988	Avg.	89.4	111.8	496.90	115.4
1989	Avg.	96.2	117.0	534.65	126.0
1990	Avg.	103.2	123.4	571.43	129.7
1991	Avg.	106.5	120.1	600.35	133.7
Jan	1991	—	125.6	—	133.0
Feb	1991	—	121.5	597.70	133.0
Mar	1991	105.8	119.1	—	133.3
Apr	1991	—	117.6	—	133.3
May	1991	—	117.8	592.00	133.4
June	1991	106.0	120.4	—	133.4
July	1991	—	120.4	—	133.5 **R**
Aug	1991	—	119.9	599.50	133.8
Sept	1991	106.6	118.3	—	134.2
Oct	1991	—	118.7	—	134.3
Nov	1991	—	120.6	612.20	134.4
Dec	1991	107.6	121.2	—	134.5
Jan	1992	—	120.9	—	134.7
Feb	1992	—	120.9	625.20	134.7
Mar	1992	107.6	120.0	—	134.8
Apr	1992	—	120.5	—	134.8
May	1992	—	122.4	624.80	135.0
June	1992	107.3	124.6	—	135.0

P = Preliminary **R** = Revised since last month

[1] Monthly data for the period 1967 to 1990 appears in NUEXCO Monthly Report 278.

[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1989 to June 1990 = 100.0). Figures shown at end of quarter represent quarterly average. Base year changed from 1980/81 in Monthly Report 286.

[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (CATALOGUE No. 6411.0).

[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (CATALOGUE No. 6312.0). Figures for the latest fourteen months shown are subject to revision.

[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (CATALOGUE No. 6302.0).

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Canada

				Wage-earner Data: Average Hourly Earnings (C$)[4]				
Year	**Period**	**Industrial Products Price Index: All Commodities[1] (1986 = 100)[2]**	**Consumer Price Index: All Items (1986 = 100)[3]**	**Uranium Mines (SIC 057)**	**Metal Mines (SIC 061)**	**Mines, Quarries and Oil Wells (SIC 061-092)**	**Metal Rolling, Casting and Extruding (SIC 299)**	**Chemicals and Chemical Products Industries (SIC 371-379)**
1980	Avg.	75.9	67.2	—.—	—.—	—.—	—.—	—.—
1981	Avg.	83.6	75.5	—.—	—.—	—.—	—.—	—.—
1982	Avg.	89.0	83.7	—.—	—.—	—.—	—.—	—.—
1983	Avg.	92.1	88.5	17.22	15.27	14.58	10.17	11.03
1984	Avg.	96.3	92.4	17.89	16.25	15.29	10.59	11.67
1985	Avg.	99.0	96.0	18.53	16.73	15.83	11.54	12.14
1986	Avg.	100.0	100.0	19.38	16.88	15.98	12.20	12.65
1987	Avg.	102.8	104.4	20.12	17.16	16.25	13.04	13.22
1988	Avg.	107.2	108.6	20.91	18.60	17.22	13.58	13.72
1989	Avg.	109.4	114.0	21.97	19.60	18.37	14.02	14.31
1990	Avg.	109.7	119.4	22.90	20.53	19.11	14.88	15.13
1991	Avg.	108.6	126.2	24.35	22.44	20.59	14.94	16.22
Jan	1991	111.1	125.0	23.79	21.53	19.94	14.86	15.51
Feb	1991	110.6	125.0	25.23	22.32	20.39	14.82	15.84
Mar	1991	109.8	125.5	24.19	22.17	20.57	15.50	16.19
Apr	1991	109.1	125.5	24.77	22.20	20.57	14.76	16.28
May	1991	108.6	126.1	24.38	21.86	20.51	15.04	16.26
June	1991	108.5	126.7	23.58	21.96	20.10	14.67	16.25
July	1991	108.2	126.8	24.70	22.52	20.17	14.52	16.07
Aug	1991	107.8	126.9	23.78	22.32 **R**	20.96	14.72	16.01
Sept	1991	107.6	126.7	24.23	22.43	20.61	14.95	16.40
Oct	1991	107.3	126.5	24.40	22.42	20.80	15.13	16.43
Nov	1991	107.3	127.0	24.58	22.68	21.05	15.00	16.46
Dec	1991	107.2	126.4	24.53	22.80	21.39	15.30	16.92
Jan	1992	107.2	127.0	24.79	22.78	21.48	15.78	16.91
Feb	1992	108.1	127.1	24.42	22.60	21.41	16.18	16.82
Mar	1992	108.2	127.5	24.92	22.92	21.37	16.31	16.62
Apr	1992	108.1	127.6	** [5]	23.39	22.04	16.60	16.69
May	1992	108.6 **R**	127.8	**	23.22 **R**	21.47 **R**	16.64 **R**	16.78 **R**
June	1992	108.8 **R**	128.1	**	23.33 **P**	21.48 **P**	16.86 **P**	17.03 **P**
July	1992	108.9	128.4	**	—.—	—.—	—.—	—.—

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (CATALOGUE 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1990 is found in NUEXCO Monthly Report 278.

[2] New Base Year of 1986 as of NUEXCO Monthly Report 266. Previous Base Year was 1981.

[3] New Base Year of 1986 as of NUEXCO Monthly Report 264. Previous Base Year was 1981.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1990 is found in NUEXCO Monthly Report 278. SIC number revisions shown starting in Monthly Report 287.

[5] As of April 1992, Statistics Canada no longer provides specific information on uranium mine wages. The data has been included with Metal Mines (SIC 061).

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South Africa

Year	Period	Average Declared Working Costs per Metric Ton of Gold Ore Milled[1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled[2] (March 1982 = 100)	Consumer Price Index[3] (1990 = 100)	Production Price Index All Groups[4] (1990 = 100)	Total Employment in Mining and Quarrying[5]	Total Salaries and Wages in Mining and Quarrying[5] (1,000 Rand)
							Annual Total[6]
1980	Avg.	35.50	—	25.5	27.7	709,042	2,237,689
1981	Avg.	41.87	—	29.4	31.5	722,918	2,756,928
1982	Avg.	47.23	103.9	33.7	35.9	702,041	3,181,584
1983	Avg.	51.88	115.0	37.8	39.7	700,901	3,563,282
1984	Avg.	58.95	130.3	42.2	43.0	711,511	4,134,390
1985	Avg.	68.70	151.7	49.1	50.3	724,587	4,778,612
1986	Avg.	80.18	177.9	58.2	60.1	756,637	5,767,950
1987	Avg.	95.01	223.1	67.6	68.5	751,864	6,911,395
1988	Avg.	106.69	241.1	76.2	77.5	705,355	7,774,054
1989	Avg.	116.65	273.0	87.4	89.3	700,360	8,833,934
1990	Avg.	129.37	305.3	100.0	100.0	677,742	10,193,209
1991	Avg.	136.06	322.4	115.1	111.4	630,722	10,934,073
							Monthly Total
Jan	1991	—	—	107.7	108.6	648,944	935,839
Feb	1991	—	—	109.0	109.0	650,948	893,373
Mar	1991	137.66	323.82	110.0	108.2	651,843	924,930
Apr	1991	—	—	111.5	108.8	639,939	887,722
May	1991	—	—	113.2	109.8	630,481	887,107
June	1991	134.65	317.23	114.0	110.3	640,908	890,595
July	1991	—	—	115.5	111.2	637,581	881,182
Aug	1991	—	—	117.1	112.0	633,699	963,710
Sept	1991	137.11	329.05	118.7	113.2	639,535	1,014,424
Oct	1991	—	—	119.8	114.8	584,435	860,529
Nov	1991	—	—	120.9	115.3	602,461	853,864
Dec	1991	134.81	319.33	123.8	115.8	602,486	940,798
Jan	1992	—	—	125.1	115.9	622,143	953,440
Feb	1992	—	—	126.2	116.3	618,114	925,858
Mar	1992	139.69	331.46	127.3	116.9	620,773 **R**	954,628 **R**
Apr	1992	—	—	128.9	118.4	608,027	941,295
May	1992	—	—	129.9	119.4	—	—
June	1992	140.69	334.63	131.2	120.5	—	—
July	1992	—	—	132.4	—	—	—

P = Preliminary **R** = Revised since last month

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[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in NUEXCO Monthly Report 278.

[2] Page 16 of Report 178 contains description and calculation of index.

[3] Central Statistical Service, Pretoria: All income groups-weighted average. Historical Data by month appears in NUEXCO Monthly Report 278.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa. Base Year changed from 1985 to 1990 in NUEXCO Monthly Report 284.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in NUEXCO Monthly Report 236.

[6] Annual total is shown, rather than monthly average, for indicated year.

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United States

Year	Period	Producer Price Index[1] Industrial Commodities (1982=100)	Producer Price Index[1] All Commodities (1982=100)	Consumer Price Index[2] (1982-84=100)	GNP Implicit Price Deflator[3] (1987=100)	GDP Implicit Price Deflator[3] (1987=100)	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4] Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
1980	Avg.	88.0	89.8	82.4	71.7	71.7	10.26	10.63	8.31	6.94
1981	Avg.	97.4	98.0	90.9	78.9	78.9	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	83.8	83.8	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	87.2	87.2	12.58	13.43	10.58	8.66
1984	Avg.	103.3	103.7	103.9	91.1	91.0	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	94.4	94.4	13.38	13.74	11.57	9.46
1986	Avg.	100.0	100.2	109.6	96.9	96.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	100.0	100.0	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	103.9	103.9	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	108.5	108.5	13.59	13.72	13.09	10.05
1990	Avg.	115.8	116.3	130.7	113.2	113.2	14.10	14.36	13.54	10.32
1991	Avg.	116.5	116.5	136.2	117.8	117.8	14.89	14.64	14.07	10.73
Jan	1991	119.3	119.0	134.6	—	—	14.73	14.63	13.85	10.60
Feb	1991	117.2	117.2	134.8	—	—	14.80	14.55	13.81	10.59
Mar	1991	115.6	116.1	135.0	116.4	116.5	14.93	14.55	13.85	10.55
Apr	1991	115.6	116.0	135.2	—	—	14.85	14.56	13.96	10.63
May	1991	116.1	116.5	135.6	—	—	14.79	14.52	14.01	10.66
June	1991	116.1	116.4	136.0	117.4	117.5	14.88	14.51	14.05	10.74
July	1991	116.0	116.1	136.2	—	—	15.09	14.56	14.16	10.77
Aug	1991	116.3	116.2	136.6	—	—	14.82	14.64	14.06	10.78
Sept	1991	116.3	116.1	137.2	118.2	118.2	15.04	14.59	14.21	10.84
Oct	1991	116.7	116.4	137.4	—	—	14.94	14.75	14.25	10.78
Nov	1991	116.7	116.4	137.8	—	—	15.29	14.89	14.27	10.88
Dec	1991	116.1	115.9	137.9	118.9	118.9	15.13	14.87	14.34	10.96
Jan	1992	115.7	115.6	138.1	—	—	15.06	14.74	14.30	10.90
Feb	1992	116.0	116.0	138.6	—	—	15.22	14.67	14.29	10.90
Mar	1992	115.9	116.1	139.3	119.8	119.8	15.05	14.57	14.26	10.92
Apr	1992	116.3	116.3	139.5	—	—	15.02	14.61	14.39	10.98
May	1992	117.2	117.1	139.7	—	—	15.09 **R**	14.76 **R**	14.39 **R**	10.99 **R**
June	1992	118.0	117.8	140.2	120.6	120.6 **R**	15.20 **P**	14.67 **P**	14.38 **R**	11.06
July	1992	118.1	117.8	140.5	—	—	—.—	—.—	14.51 **P**	11.05 **P**

P = Preliminary **R** = Revised since last month

[1] US Bureau of Labor Statistics, Washington, DC: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents. Historical data is presented in NUEXCO Monthly Report 278.

[2] US Bureau of Labor Statistics, Washington, DC: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in NUEXCO Monthly Report 278.

[3] US Department of Commerce, Washington, DC: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The Gross National Product (GNP) and Gross Domestic Product (GDP) Implicit Price Deflators (IDP) are published quarterly, and seasonally adjusted. Historical data for the GNP IPD is presented in Report 278. GDP IPD information first published in NUEXCO Monthly Report 288. GNP IPD Base Year change from 1982 to 1987 in NUEXCO Monthly Report 284.

[4] US Bureau of Labor Statistics, Washington, DC: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in NUEXCO Monthly Report 278.

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Uranium Deliveries To The European Community[1]

— Compiled from data published by the Euratom Supply Agency —

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price		Spot Contracts[3] Average Price	
			in ECU per pound U_3O_8	in US Dollars per pound U_3O_8	in ECU per pound U_3O_8	in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19
1990	12,800	16.7	ECU 23.08	$29.39	ECU 7.60	$ 9.68
1991	12,900	13.0	ECU 21.05 **R**	$26.09	ECU 7.30 **R**	$ 9.05

P = Preliminary **R** = Revised since last month

[1] The twelve European Community member nations are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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US Uranium Marketing Data

— Compiled from data published by the US Energy Information Administration [1] —

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers [2] (million pounds U_3O_8)	Average Price of Delivered Uranium [2] (\$/lb. U_3O_8)	Quantity of Uranium Imported [3] (million pounds U_3O_8)	Average Price of Imported Uranium (\$/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	$16.10	3.6	n/a	1.2
1977	29.9	27.8	$19.75	5.6	n/a	4.0
1978	37.0	31.6	$21.60	5.2	n/a	6.8
1979	37.5	33.0	$23.85	3.0	n/a	6.2
1980	43.7	35.0	$28.15	3.6	$43.10	5.8
1981	38.5	32.6	$34.65	6.6	$32.90	4.4
1982	26.9	23.5	$38.37	17.1	$25.19	6.2
1983	21.2	24.2	$38.21	8.2	$26.16	3.3
1984	14.9	22.5	$32.65	12.5	$21.86	2.2
1985	11.3	21.7	$31.43	11.7	$20.08	5.3
1986	13.5	18.9	$30.01	13.5	$20.07	1.6
1987	13.0	20.8	$27.37	15.1	$19.14	1.0
1988	13.1	17.6	$26.15	15.8	$19.03	3.3
1989	13.8	18.4	$19.56	13.1	$16.75	2.1
1990	8.9	20.5	$15.70	23.7	$12.55	2.0

P = Preliminary **R** = Revised since last month

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity*. 1984-1990: Energy Information Administration, *Uranium Industry Annual*.

[2] Data for 1976-1981 includes both domestic utilities and agents.

[3] Includes imports by domestic utilities and domestic suppliers.

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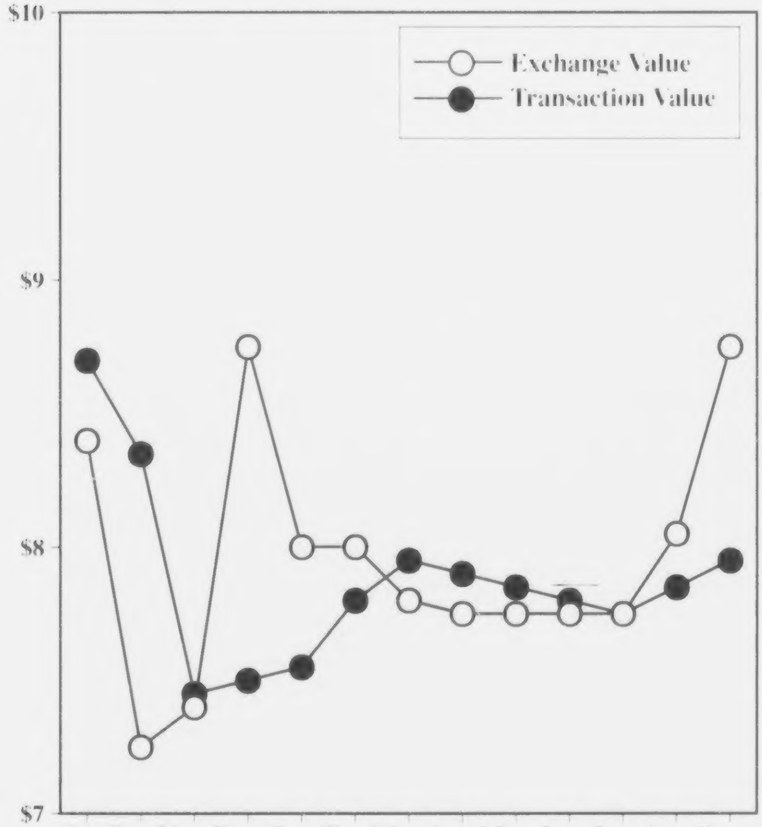

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MARKET REVIEW

Market Values Summary

NUEXCO Market Values	This Report September 30, 1992	Last Report August 31, 1992	12 Months Ago September 30, 1991
EXCHANGE VALUE [1]	**$8.75** / lb equivalent U_3O_8	$8.05	$8.40
UF_6 VALUE [2]	**$26.00** / kg U as UF_6	$24.25	$25.50
LOAN RATE [3]	**3.0%** / annum	3.0%	3.5%
CONVERSION VALUE [4]	**$1.40** / lb U as UF_6	$1.50	$1.55
SWU VALUE [5] **(0.3 w/o tails assay)**	**$68** / SWU	$66	$67
TRANSACTION VALUE [6]	**$7.95** / lb equivalent U_3O_8	$7.85	$8.70
Transactions	**29**	28	20
Months	**3**	3	3
Millions of Pounds	**7.8**	8.3	4.4

DEFINITIONS

[1] The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

[2] The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

[3] The **Loan Rate** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

[4] The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

[5] The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

[6] The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

- **a)** Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;
- **b)** At least ten transactions;
- **c)** Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.
- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.
- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight-percent (w/o) ^{235}U and a product assay of 3.0 weight-percent ^{235}U, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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SEPTEMBER MARKET REVIEW

(as of September 30, 1992)

OVERVIEW

Prices climbed steadily during September, as market participants speculated on higher prices due to the anti-dumping case. The September 30 Exchange Value rose \$0.70, to \$8.75 per pound U_3O_8 and the UF_6 Value increased \$1.75, to \$26.00 per kgU as UF_6.

Eight near-term uranium transactions were reported, totalling more than 2.7 million pounds equivalent U_3O_8 (**Table 1**). The market continued its relatively high level of activity and, year-to-date, 100 spot and near-term uranium transactions have been reported for a total exceeding 32.4 million pounds equivalent U_3O_8. This volume already surpasses the total annual sales volume of both 1989 (32.3 million pounds) and 1991 (30.0 million pounds), falling short only of the 1990 record of 40.1 million pounds. Given the traditional reduced level of fourth quarter market activity, it is unlikely, absent a surge in demand in reaction to an anti-dumping decision, that 1992 sales volume will overtake the 1990 record volume.

The Loan Rate remained unchanged at 3.0 percent per annum. One loan for a small quantity of concentrates was reported. The Conversion Value fell \$0.10, to \$1.40 per pound U as UF_6, as sellers competed for limited secondary market sales opportunities. One near-term conversion sale was reported, involving a moderate quantity of conversion services, and one long-term sale, involving a large quantity for delivery from 1993 through 1997, also was reported.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	September 1992		Year-to-Date	
	No. of Sales	Volume[1]	No. of Sales	Volume[1]
Concentrates	3	0.5	65	19.2
Natural UF_6	4	0.7	22	6.4
EUP	1	1.5	13	6.8
Total[2]	**8**	**2.7**	**100**	**32.4**

[1] Million pounds equivalent U_3O_8

[2] Due to independent rounding, columns may not equal total.

The SWU Value climbed two dollars, to \$68 per SWU, as the anti-dumping case also affected the enrichment market. One enriched uranium product (EUP) sale was reported, involving a large quantity of SWU and contained uranium feed.

NATURAL URANIUM AND CONVERSION

The convergence of a number of different factors, both individually and collectively, has led to a complex situation in the spot and near-term uranium market. These factors include:

- Form of the uranium.
- National origin of the uranium.
- Physical location of the uranium.
- Specifications of the uranium.
- Size of the lots offered or sought.
- Credibility of the buyers and sellers.

None of these factors is new to the marketplace, nor is it unusual to have all of them present and interacting simultaneously from time to time. Depending on the given situation, the influence of one or more of these factors may result in prices being paid that are higher or lower than the Exchange Value.

The interaction of these factors will occasionally result in wider than normal price distributions. Higher prices may be evident when a buyer insists upon specific nationality, specific tonnage, specific delivery date or location, specific category of seller, or some combination of the above. Similarly, lower prices may be evident if quantity, form, nationality, delivery date, or location is other than what is optimally desired. The definition of Exchange Value presumes no particulars other than *uranium concentrates*. Thus, depending on individual circumstances and the values attributed to one factor or another, actual prices paid may

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be higher or lower than the Exchange Value. Disparities among the values attributed to these factors by buyers and sellers can account for wide variations in price.

Over the past few weeks, several factors have contributed to a wider price range than has been typical, and key deadlines concerning the anti-dumping case have become focal points for market participants. September 16 was the initial deadline for a negotiated suspension agreement; this deadline was extended 20 days, but even so, no settlement was reached. The next critical date is October 16, when the Department of Commerce is scheduled to issue its final determination. The case then goes to the International Trade Commission (ITC), which will decide if injury to the domestic industry has occurred.

During September, as these dates approached, potential implications of the anti-dumping petition had an increasing impact on the uranium market. Speculating on higher prices, some sellers were less aggressive, and some buyers hedged by making discretionary purchases. At least three of September's eight reported uranium transactions were concluded by discretionary buyers, possibly in an effort to protect against a future price rise. Less aggressive sales efforts and increased discretionary demand can each support a price increase; with both occurring in September, market prices climbed steadily during the month.

Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply[1]	Active Demand[1]
• Uranium (thousand lbs equivalent U_3O_8)	6,730	1,675
• Supply/Demand Ratio:	4.0	
• Loan (thousand lbs equivalent U_3O_8)	8,650	1,250
• Conversion (thousand lbs U as UF_6)	3,300	620
• SWU (thousand SWUs)	905	480

[1] Supply and Demand tables in the Market Review section of this Report provide details for each category.

The September 30 **Exchange Value** increased $0.70 (8.7%), to **$8.75** per pound U_3O_8. Specific bids and offers ranged above and below the Exchange Value, as delivery and origin considerations significantly affected prices.

Three near-term concentrates transactions were reported, in which two US utilities and an intermediary purchased a total exceeding 500 thousand pounds equivalent U_3O_8. All three sales transpired earlier in September and, consequently, occurred at price levels below the September 30 Exchange Value.

* * *

As in the concentrates market, UF_6 prices increased consistently throughout the month, and the **UF_6 Value** rose $1.75 (7.2%), to **$26.00** per kgU as UF_6. The primary influences on the UF_6 market this past month were geographic and origin considerations. Four natural UF_6 transactions were reported, in which US utilities purchased more than 700 thousand pounds equivalent U_3O_8 for near-term delivery. All four sales occurred earlier in the month, and were concluded at price levels below the September 30 UF_6 Value; all involved US buyers and sellers.

* * *

No **long-term uranium** transactions were reported during September, although at month end, five utilities were evaluating long-term offers totalling as much as 27.6 million pounds equivalent U_3O_8 for delivery during the period 1993 through 2005.

* * *

The **Transaction Value** climbed $0.10 for the second consecutive month, to **$7.95** per pound U_3O_8. Higher-priced sales during August and September led to the increase, although the amount of increase was moderated by the high volume of lower-priced sales in July. The September 30 Transaction Value was based on 29 transactions over three months involving 7.8 million pounds equivalent U_3O_8.

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As sellers became less aggressive, **active uranium supply** declined somewhat; dropping by 1.5 million pounds, to **6.7** million pounds equivalent U_3O_8. Simultaneously, some discretionary buyers, looking to hedge against future price increases, entered the market, and **active uranium demand** at month end had increased by 370 thousand pounds, to **1.7** million pounds equivalent U_3O_8 (**Table 2**). Although supply still dwarfs demand, and the **supply/demand ratio** equals **4.0**, much of the supply can be considered price sensitive, with its near-term availability dependent on higher spot market prices.

* * *

The **Loan Rate** remained unchanged at **3.0** percent per annum, and available loan supply increased to more than 8 million pounds equivalent U_3O_8. Only one natural uranium loan was reported, in which an intermediary borrowed a small quantity of concentrates from a producer. A number of additional loans are in various stages of negotiation as market participants continue to view the loan market as an attractive means of achieving a positive return on excess inventories.

* * *

The **Conversion Value** declined $0.10, to **$1.40** per pound U as UF_6. Sharp competition among sellers, particularly in the USA, for limited secondary market sales opportunities led to the decrease. One near-term transaction was reported, in which a utility purchased a moderate quantity of conversion services at a price near the September 30 Conversion Value. In addition, one long-term transaction was reported; earlier in the year, a US utility purchased a large quantity of conversion services from a primary convertor for delivery during the period 1993 through 1997.

* * *

ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

The same factors affecting the uranium market also have affected the enrichment market. The **SWU Value** climbed two dollars, to **$68** per SWU. Sellers were less aggressive in September, but the associated price increase was tempered by the continued low level of demand. One enrichment transaction was reported, in which an intermediary purchased approximately 1.5 million pounds equivalent U_3O_8 and a large quantity of SWU in the form of EUP.

Table 3
ENRICHMENT PRICES
(September 30, 1992)

Prices	This Month Report 290	Last Month Report 289	12 Months Ago Report 278
NUEXCO SWU Value ($US per SWU)	68	66	67
US DOE SWU prices: ($US per SWU)			
USC	125.00[1]	121.50[2]	121.50[2]
AFC	153.00[3]	153.00[3]	153.00[3]
Requirements	157.00[3]	157.00[3]	157.00[3]
Incentive Price (IP2)	109.05[4]	104.75[5]	104.75[5]
Calculated worth of enriched UF_6[6]: ($US per KgU as UF_6)			
2.0 $^{w}/_{o}$ ^{235}U	223	213	219
2.5 $^{w}/_{o}$ ^{235}U	312	298	306
3.0 $^{w}/_{o}$ ^{235}U	403	386	396
3.5 $^{w}/_{o}$ ^{235}U	497	476	488
4.0 $^{w}/_{o}$ ^{235}U	592	567	582
4.5 $^{w}/_{o}$ ^{235}U	689	660	677

[1] Effective 10/1/92.
[2] Effective 10/1/91 to 9/30/92.
[3] Effective since 10/1/84.
[4] Provisional IP2 for FY93: Effective 10/1/92 to 9/30/93, for up to 30% of annual requirements.
[5] IP2: Effective 10/1/91 to 9/30/92, for up to 30% of annual requirements.
[6] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 $^{w}/_{o}$ ^{235}U tails assay.

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RECENT TRANSACTIONS

Uranium Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5545	1993	101-300	90-97	Intermediary	Intermediary	
5548	1992	Less than 50	90-97	Utility	Intermediary	UF_6
5549	1992	101-300	90-97	Utility	Intermediary	
5552	1992	50-100	90-97	Utility	**R**	
5553	1992-1994	101-300	90-97	Utility	Intermediary	UF_6
5555A	1992-1993	1,001-3,000	See remarks	Intermediary	**R**	Contained in EUP
5556	1993	101-300	90-97	Utility	Intermediary	UF_6
5557	1993	101-300	90-97	Utility	Intermediary	UF_6

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Exchange Value or UF6 Value. The endpoints of each range are included within that range.

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NUEXCO

MARKET REVIEW

RECENT TRANSACTIONS

Natural Uranium Loans[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Loan Rate	Borrower	Lender	Remarks
5558	1992	101-300	103-110	Intermediary	Producer	

Conversion Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range[2] of Current Conversion Value	Buyer	Seller	Remarks
5543	1992-1997	301-600	**R**	Utility	Convertor	Occurred earlier in 1992
5559	1993	101-300	**R**	Utility	**R**	

Enrichment Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity[3] (thousand SWU)	Price Within Percentage Range[2] of Current SWU Value[4]	Buyer	Seller	Remarks
5555B	1992-1993	301-600	See remarks	Intermediary	**R**	Contained in EUP

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., **X** dollars less than DOE's USC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

Uranium Supply

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
90-1078A	235	—	1992-1993	UF_6e
91-1505	1,250	—	1992-1993	
91-1507	500	—	1992	
91-1511	1,305	—	1992	UF_6/UF_6e
91-1512	785	—	1993	UF_6
92-1141	200	—	1992	
92-1194	200	—	1992	
92-1201A	840	—	1993	UF_6e
92-1501A	915	—	1992	UF_6e
92-1512	500	—	1993	
91-1268	—	600 per year	1992-1999	
92-1129	—	2,600 per year	1993-1999	
92-1185	—	2,600 per year	1993-1999	
92-1261	—	520 per year	1993-2000	
92-1513	—	1,300 per year	1992-1999	
TOTAL	**6,730**			
INACTIVE	**2,800**			
AVAILABLE TO LOAN:				
ACTIVE				
92-1072	3,100	—	1992	UF_6
92-1074	1,000	—	1992	
92-1206	500	—	1992	
92-1258	1,250	—	1993 -	
92-1267*	400	—	1992	
92-1268*	1,000	—	1992	
92-1503	1,000	—	1992	
92-1515	400	—	1992	
TOTAL	**8,650**			
INACTIVE	**1,610**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: 92-1257A

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SUPPLY AND DEMAND

Uranium Demand

	Quantity (Thousand Pounds equivalent U_3O_8)			
NUEXCO Project Number	**Spot or Near-term[1]**	**Intermediate or Long-term[2]**	**Delivery Period**	**Remarks**
INQUIRIES TO PURCHASE:				
ACTIVE				
92-1255	125	—	1992-1993	
92-1264A	30	—	1992-1993	UF_6e
92-1279*	220	—	1992	
92-1283A*	200	—	1993	UF_6e
92-1285*	500	—	1993	
92-1289*	100	—	1993	U_3O_8/UF_6
92-1514	500	—	1993	U_3O_8/UF_6
91-1184	—	350 per year	1993-1997	
92-1199	—	2,000	1992-1999	
92-1223	—	400 per year	1997-2000	U_3O_8/UF_6
92-1226	—	300 per year	1994-1996	
92-1235	—	500 per year	1995-2000	U_3O_8/UF_6
92-1245	—	1,960	1993-2000	UF_6
92-1252	—	4,000	1995-2000	
92-1253*	—	800 per year	1996-2003	
92-1274A*	—	790	1993-1996	U_3O_8/UF_6
92-1276*	—	800 per year	1993-1997	
92-1280*	—	2,000	1993-2000	
92-1281*	—	2,000	1993-2000	
92-1287*	—	750 per year	1996-2000	U_3O_8/UF_6
92-1290*	—	200 per year	1993-1996	
TOTAL	**1,675**			
INACTIVE	**1,785**			
INQUIRIES TO BORROW:				
ACTIVE				
92-1505	500	—	1992	
92-1511	750	—	1992	
TOTAL	**1,250**			
INACTIVE	*none reported*			

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* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: 92-1152A, 92-1227, 92-1231, 92-1256, 92-1259

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SUPPLY AND DEMAND

Conversion Supply and Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1500	400	—	1992	
91-1501	1,100	—	1992	
92-1190	300	—	1993	
92-1507	500	—	1992	
92-1516	1,000	—	1992	
TOTAL	**3,300**			
INACTIVE	*none reported*			
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1275	620	—	1992-1993	
92-1178	—	3,300 per year	1992-1995	
92-1274B*	—	670	1993-1996	
92-1275*	—	85	1994	
TOTAL	**620**			
INACTIVE	*none reported*			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: *none*

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SUPPLY AND DEMAND

SWU Supply and Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
90-1078B	75	—	1992-1993	UF$_6$e
91-1509	200	—	1992	
91-1515	100	—	1992	
92-1201B	180	—	1993	UF$_6$e
92-1501B	100	—	1992	UF$_6$e
92-1124	250	250 per year	1992-1994	
TOTAL	**905**			
INACTIVE	**50**			
INQUIRIES TO PURCHASE:				
ACTIVE				
92-1236	40	—	1993	
92-1264B	5	—	1992-1993	UF$_6$e
92-1277*	140	—	1993	UF$_6$e
92-1282*	250	—	1993	
92-1283B*	45	—	1993	UF$_6$e
90-1196	—	60 per year	1995 on	
91-1152	—	2,700	1995-2001	
92-1016	—	170 per year	1996-2006	
92-1288*	—	45	1994	
TOTAL	**480**			
INACTIVE	*none reported*			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: 92-1152B, 92-1257B

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES[1]

Australia
to
Hungary

	Australia (dollar)	Belgium (franc)	Canada (dollar)	China (renminbi)	CSFR (koruna)	EC (ecu)	Finland (markka)	France (franc)	Germany (mark)	Hungary (forint)
EXCHANGE VALUE										
per pound equivalent U_3O_8 as Concentrates										
This Month (Sept 30, 1992)	**12.27**	**254.88**	**10.91**	**48.58**	**231.61**	**6.34**	**39.23**	**41.86**	**12.38**	**665.53**
Last Month (Aug 31, 1992)	11.25	232.93	9.62	43.75	210.10	5.58	31.13	38.46	11.29	597.71
12 Months Ago (Sept 30, 1991)	10.51	287.97	9.50	45.16	—.—	6.82	34.06	47.63	13.97	—.—
per kg U as Concentrates										
This Month (Sept 30, 1992)	**31.90**	**662.63**	**28.37**	**126.30**	**602.14**	**16.47**	**102.00**	**108.84**	**32.18**	**1,730**
Last Month (Aug 31, 1992)	29.25	605.56	25.01	113.74	546.23	14.52	80.92	99.99	29.34	1,554
12 Months Ago (Sept 30, 1991)	27.33	748.65	24.71	117.41	—.—	17.73	88.55	123.82	36.32	—.—
UF_6 VALUE										
per kg U as UF_6										
This Month (Sept 30, 1992)	**36.47**	**757.36**	**32.42**	**144.35**	**688.22**	**18.83**	**116.58**	**124.40**	**36.78**	**1,978**
Last Month (Aug 31, 1992)	33.89	701.68	28.98	131.79	632.92	16.82	93.77	115.86	34.00	1,801
12 Months Ago (Sept 30, 1991)	31.91	874.19	28.85	137.10	—.—	20.71	103.40	144.58	42.41	—.—
TRANSACTION VALUE										
per pound equivalent U_3O_8 as Concentrates										
This Month (Sept 30, 1992)	**11.15**	**231.58**	**9.91**	**44.14**	**210.44**	**5.76**	**35.65**	**38.04**	**11.24**	**604.68**
Last Month (Aug 31, 1992)	10.97	227.14	9.38	42.66	204.88	5.45	30.35	37.50	11.01	582.86
12 Months Ago (Sept 30, 1991)	10.89	298.25	9.84	46.78	—.—	7.06	35.28	49.33	14.47	—.—
per kg U as Concentrates										
This Month (Sept 30, 1992)	**28.99**	**602.05**	**25.77**	**114.75**	**547.09**	**14.97**	**92.67**	**98.89**	**29.23**	**1,572**
Last Month (Aug 31, 1992)	28.52	590.52	24.39	110.91	532.66	14.16	78.91	97.50	28.61	1,515
12 Months Ago (Sept 30, 1991)	28.31	775.39	25.59	121.61	—.—	18.37	91.72	128.24	37.62	—.—
CONVERSION VALUE										
per pound U as UF_6										
This Month (Sept 30, 1992)	**1.96**	**40.78**	**1.75**	**7.77**	**37.06**	**1.01**	**6.28**	**6.70**	**1.98**	**106.48**
Last Month (Aug 31, 1992)	2.10	43.40	1.79	8.15	39.15	1.04	5.80	7.17	2.10	111.38
12 Months Ago (Sept 30, 1991)	1.94	53.14	1.75	8.33	—.—	1.26	6.29	8.79	2.58	—.—
per kg U as UF_6										
This Month (Sept 30, 1992)	**4.33**	**89.91**	**3.85**	**17.14**	**81.70**	**2.23**	**13.84**	**14.77**	**4.37**	**234.76**
Last Month (Aug 31, 1992)	4.62	95.69	3.95	17.97	86.31	2.29	12.79	15.80	4.64	245.54
12 Months Ago (Sept 30, 1991)	4.28	117.15	3.87	18.37	—.—	2.77	13.86	19.37	5.68	—.—
SWU VALUE										
per SWU at 0.30% ^{235}U Tails Assay										
This Month (Sept 30, 1992)	**95.37**	**1,981**	**84.80**	**377.54**	**1,800**	**49.24**	**304.91**	**325.34**	**96.18**	**5,172**
Last Month (Aug 31, 1992)	92.24	1,910	78.87	358.69	1,723	45.79	255.20	315.32	92.53	4,901
12 Months Ago (Sept 30, 1991)	83.85	2,297	75.81	360.22	—.—	54.40	271.68	379.88	111.43	—.—

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[1] Calculated using currency exchange rates for the last business day of the month, as published in *The Wall Street Journal.*

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES[1]

Italy *to* United States	Italy (lira)	Japan (yen)	Netherlands (guilder)	S. Africa (comm. rand)	S. Korea (won)	Spain (peseta)	Sweden (krona)	Switzerland (franc)	Taiwan (dollar)	UK (pound)	USA (dollar)
EXCHANGE VALUE											
per pound equivalent U_3O_8 as Concentrates											
This Month (Sept 30, 1992)	**10,681**	**1,050**	**13.94**	**24.61**	**7,000**	**868.23**	**46.39**	**10.81**	**218.05**	**4.92**	**8.75**
Last Month (Aug 31, 1992)	8,617	989.79	12.72	22.04	6,325	733.02	41.28	10.05	199.88	4.05	8.05
12 Months Ago (Sept 30, 1991)	10,456	1,116	15.75	23.56	6,111	885.80	51.00	12.18	220.08	4.80	8.40
per kg U as Concentrates											
This Month (Sept 30, 1992)	**27,769**	**2,730**	**36.25**	**63.97**	**18,198**	**2,257**	**120.62**	**28.10**	**566.89**	**12.80**	**22.75**
Last Month (Aug 31, 1992)	22,402	2,573	33.08	57.29	16,443	1,906	107.32	26.12	519.65	10.52	20.93
12 Months Ago (Sept 30, 1991)	27,182	2,901	40.95	61.26	15,888	2,303	132.59	31.66	572.16	12.47	21.84
UF_6 VALUE											
per kg U as UF_6											
This Month (Sept 30, 1992)	**31,738**	**3,120**	**41.43**	**73.12**	**20,800**	**2,580**	**137.86**	**32.12**	**647.93**	**14.63**	**26.00**
Last Month (Aug 31, 1992)	25,958	2,982	38.33	66.38	19,052	2,208	124.36	30.26	602.13	12.20	24.25
12 Months Ago (Sept 30, 1991)	31,740	3,388	47.82	71.53	18,552	2,689	154.83	36.97	668.10	14.56	25.50
TRANSACTION VALUE											
per pound equivalent U_3O_8 as Concentrates											
This Month (Sept 30, 1992)	**9,705**	**954.04**	**12.67**	**22.36**	**6,360**	**788.85**	**42.15**	**9.82**	**198.12**	**4.47**	**7.95**
Last Month (Aug 31, 1992)	8,403	965.20	12.41	21.49	6,168	714.81	40.26	9.80	194.91	3.95	7.85
12 Months Ago (Sept 30, 1991)	10,829	1,156	16.31	24.40	6,330	917.43	52.82	12.61	227.94	4.97	8.70
per kg U as Concentrates											
This Month (Sept 30, 1992)	**25,230**	**2,480**	**32.94**	**58.12**	**16,535**	**2,051**	**109.59**	**25.54**	**515.06**	**11.63**	**20.67**
Last Month (Aug 31, 1992)	21,846	2,509	32.26	55.87	16,034	1,858	104.66	25.47	506.74	10.26	20.41
12 Months Ago (Sept 30, 1991)	28,153	3,005	42.41	63.44	16,455	2,385	137.33	32.79	592.59	12.92	22.62
CONVERSION VALUE											
per pound U as UF_6											
This Month (Sept 30, 1992)	**1,709**	**168.01**	**2.23**	**3.94**	**1,120**	**138.92**	**7.42**	**1.73**	**34.89**	**0.79**	**1.40**
Last Month (Aug 31, 1992)	1,606	184.43	2.37	4.11	1,179	136.59	7.69	1.87	37.24	0.75	1.50
12 Months Ago (Sept 30, 1991)	1,929	205.93	2.91	4.35	1,128	163.45	9.41	2.25	40.61	0.89	1.55
per kg U as UF_6											
This Month (Sept 30, 1992)	**3,768**	**370.39**	**4.92**	**8.68**	**2,469**	**306.26**	**16.37**	**3.81**	**76.92**	**1.74**	**3.09**
Last Month (Aug 31, 1992)	3,540	406.61	5.23	9.05	2,598	301.12	16.96	4.13	82.11	1.66	3.31
12 Months Ago (Sept 30, 1991)	4,253	453.99	6.41	9.59	2,486	360.35	20.75	4.95	89.53	1.95	3.42
SWU VALUE											
per SWU at 0.30% ^{235}U Tails Assay											
This Month (Sept 30, 1992)	**83,008**	**8,160**	**108.37**	**191.23**	**54,400**	**6,747**	**360:55**	**84.01**	**1,695**	**38.26**	**68.00**
Last Month (Aug 31, 1992)	70,649	8,115	104.31	180.67	51,854	6,010	338.46	82.37	1,639	33.19	66.00
12 Months Ago (Sept 30, 1991)	83,396	8,901	125.63	187.94	48,745	7,065	406.80	97.14	1,755	38.26	67.00

[1] Calculated using currency exchange rates for the last business day of the month, as published in *The Wall Street Journal*.

WASHINGTON FOCUS

by Linda L. Gunter

As of October 6, Congress had concluded most of its business; however, although eager to return to their home states to continue campaigning for reelection, Senate action was delayed by a filibuster on the tax bill by Sen. Alfonse D'Amato (R-NY) and a threat of a filibuster by Nevada's Senators over the National Energy Strategy bill (HR 776).

Congress completed work on appropriations for FY 1993 government programs, including the bill which funds DOE and NRC programs. By the end of September, the House and Senate conferees on the Energy bill had worked out an agreement on the variant issues of the two versions of the bill. The House of Representatives approved the Energy bill conference report on October 5, and the Senate approved the report on October 8.

Energy and Water Appropriations Bill

On September 24, the Senate voted to adopt the conference report on the Energy & Water Appropriations bill (HR 5373) and the President signed the bill on October 1. The $22.3 billion bill will fund DOE energy programs for FY 1993, and increase spending on advanced reactor research and development (R&D) and the characterization of Yucca Mountain for spent fuel storage. The bill also will increase funding by $2 million, to $18 million, for high temperature gas-cooled reactor R&D; it will increase funding for R&D on the liquid metal reactor program by $1 million, to $12.5 million. The light water reactor program will receive $58.7 million, the amount requested by DOE, but a reduction from the $65.5 million allocated last year. The advanced light water reactor program will be cut from $56 million to $50 million.

The bill will provide $11 million in FY 1993 to the State of Nevada for the Yucca Mountain spent fuel storage repository. Of the total, $6 million is designated as impact aid for local governments affected by the facility. In allocating the funds to the state, Congress specified that the money could not be spent on lobbying efforts and legal expenses to fight the repository.

After heavy industry pressure, Congress increased the overall high-level nuclear waste budget of HR 5373, composed of money allocated from funds collected from utilities via a millage fee, from $275 million to $375 million. Utilities complained that although the money was being collected, Congress and DOE were reluctant to spend from the fund because it was being used to offset the budget deficit. This reluctance was causing problems for DOE, since its characterization schedule required increased spending in order to meet the 1998 deadline.

The uranium enrichment program was reduced to a budget of $1.361 billion, $30 million less than DOE's request. Nevertheless, DOE plans to raise $1.462 billion for the Treasury in FY 1993 from sales of enrichment services to its customers. The $30 million reduction was taken from the AVLIS program, but strong language was included requiring that predeployment activities not be deprived of funding. For example, the DOE Secretary was directed to select a commercial deployment contractor as soon as possible. Another element of DOE's proposed budget included provisions for collecting an additional millage fee of .33 mil/kWh to begin environmental cleanup at the GDPs. Congress, however, did not authorize this funding mechanism.

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Energy Bill Clears Conference

◇ The energy bill (HR 776) cleared a House-Senate conference committee on October 1, and the compromise version of the bill was approved by the House on October 5 by a vote of 363-60. On October 8, the Senate voted to approve the conference version of the bill, sending the bill to President Bush for his signature.

Provisions included in the bill give the nuclear industry reason to feel somewhat optimistic. Conferees agreed to the nuclear licensing provisions, affirming the Nuclear Regulatory Commission's (NRC) authority as outlined in CFR Part 52, as well as requirements for NRC certification of standardized designs. Compromise was achieved on transmission access and on Public Utility Company Holding Act reform, provisions that probably will lead to restructuring of the US electric utility industry. Controversial provisions limiting off-shore oil drilling and restricting states' authority to set quotas on natural gas output were removed from the bill to ensure final passage.

An unlikely coalition of environmentalists, utilities, labor unions, and uranium mining companies combined to ensure passage (after seven years) of a restructured DOE enrichment program. In the bill's three titles related to the fuel cycle, Title IX creates a government corporation with a five-member Board of Directors. The corporation would be required to price its enrichment services in a business-like fashion and lease the two operating gaseous diffusion plants (GDP) from DOE for six years. The government corporation also would be authorized to convert Russian HEU to reactor fuel. A separate private corporation would be authorized to spend up to $364 million to build and fund AVLIS.

The government corporation would be able to issue stock equal to the book value of the assets transferred to the corporation, with this stock held by the US Treasury. Payment of the corporation's debt would be limited to the proceeds from the sale of stock and dividends. Title IX of the bill provides that Section 161v of the Atomic Energy Act would not be applied to the corporation. The significance of the exemption of the corporation from Section 161v is that the prices charged by the corporation could be lower, since it would not be required to recover its costs through its prices. However, DOE would still have to recover the cost of providing services to the corporation.

Title X creates a decontamination and decommissioning (D&D) fund for the GDPs set at $2.25 billion; annually, the utility D&D payment obligation would be set at $150 million (adjusted for inflation) and the government contribution capped at $330 million. The utility contribution would be included as a fuel cost in rate proceedings, and thus could be considered a pass-through cost.

Most of the House provisions on the uranium mining issues were adopted for the Energy bill as Title X, such as payment for cleanup of mill tailings from the D&D fund. The conferees reportedly dropped provisions that would have deprived uranium companies of the tax depletion allowance on uranium mining properties, after the conferees discovered another mechanism to fund wind and solar tax credits. Finally, Rep. Neil Abercrombie's (D-HI) amendment requiring NRC certification of plutonium casks was amended to allow more time to study the issue.

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INDUSTRY BRIEFS

NRC To Try International Nuclear Event Scale

By a vote of 3-2, the Nuclear Regulatory Commission (NRC) has voted to implement the International Nuclear Event Scale (INES) for a trial period of two to three years. The INES, developed by the International Atomic Energy Agency and the OECD's Nuclear Energy Agency and introduced on a trial basis worldwide several years ago, labels and communicates the relative seriousness of nuclear reactor events and helps put these events into proper perspective. INES has since gained widespread usage, including use by France and Japan, two countries who, like the USA, had developed their own rating scales prior to adopting the INES.

The four-tiered US scale was developed to indicate the level of emergency requirements, whereas the eight-level INES scale was developed to communicate the seriousness of events as follows:

0 – a deviation from normal operations, but with no safety implications.
1 – an anomaly.
2 – an incident.
3 – a serious incident.
4 – an accident without significant off-site risk.
5 – an accident with off-site risk
6 – a serious accident.
7 – a major accident having extensive health and environmental repercussions.

The NRC is planning workshops in the near future to introduce and explain the INES scale in the USA.

India's Kakrapar 1 Reaches Criticality

India's ninth reactor, Kakrapar 1, achieved criticality on September 3; construction began on the unit in 1985. The 220-MWe pressurized heavy water reactor, located 330 kilometers north of Bombay in the state of Gujarat, is the first in the world to use thorium oxide bundles in the core, instead of depleted uranium, for "power flattening".

India's tenth reactor, Kakrapar 2, is more than 90-percent complete and is expected to achieve criticality by the second half of 1993; it should reach commercial operation in 1994. Four more nuclear power plants are currently under construction in India.

◆ ◆ ◆

Seabrook Sets Record

After setting a record of 325 days of continuous operation, the Yankee Atomic Power Group's Seabrook nuclear plant, located in New Hampshire, shut down on September 7, 1992, for its second scheduled refueling. The plant surpassed the old record of 215 days for second-cycle operation of a Westinghouse-designed plant set by Southern Company's Farley reactor in Alabama. Roughly one-third of Seabrook's core will be replaced during this refueling process, as the reactor moves to 18-month cycles.

Darlington 2 To Resume Operation

After receiving approval from the Canadian Atomic Energy Control Board on September 4, Ontario Hydro restarted Darlington 2 on September 8 and was operating the unit at thirty percent capacity by September 25.

The 881-MWe pressurized heavy water reactor began commercial operation in October 1990, but was shut down in January 1991 due to damage to several fuel bundles. After extensive evaluation, use of five-blade impellers in the primary coolant pumps was determined to have created a resonant frequency that led to vibration of the fuel bundles. The pumps were retrofitted with seven-blade impellers to solve the problem. The pumps at Darlington 1 already have been retrofitted with the new impellers and the unit is operating near full power. Unit 3 is scheduled to begin commercial operation this autumn, and Unit 4, next spring.

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TEPCO Experiences Emergency Shutdown

On September 29, Tokyo Electric Power Company experienced an emergency shutdown at its Fukushima I nuclear power station. Unit 2, one of the 760-MWe (net) boiling water reactors at the station, located 150 miles northeast of Tokyo, was operating at full power when a human error caused one of two primary high-pressure condenser pumps (HPCP) and one secondary HPCP to be momentarily shut off.

The secondary pump was off-line for a routine inspection, after which its power supply panel was replaced incorrectly. The error resulted in a message sent to the main computer indicating that the pump was in use, when it actually was turned off. The computer proceeded to take one of the primary pumps off-line, in accordance with specifications that limit the number of operating HPCPs to no more than two. The computer's action, in turn, caused the other primary HPCP to stop because of low delivery pressure. As a result, the fuel rod water level dropped approximately three meters, initiating activation of the automatic emergency core cooling system.

Since the reactor experienced no leaks of either coolant or radioactivity, the incident was preliminarily classified at zero, the lowest level on the International Nuclear Event Scale, indicating no safety implications to either employees or the public. TEPCO currently is undertaking measures to safeguard against repetition of the problem.

General Atomics Sells Powder River Basin

On August 10, General Atomics (GA) announced that it had sold its Powder River Basin uranium properties to Pathfinder Mines for an undisclosed price. GA originally paid $1.6 million to the Tennessee Valley Authority (TVA) for the properties in a 1991 public auction. Pathfinder was one of three other bidders in that auction for the properties, estimated to contain reserves of five to seven million pounds equivalent U_3O_8.

◆ ◆ ◆

South Korea Buys Two More CANDU Reactors

On September 18, 1992, Atomic Energy of Canada Limited (AECL) announced that it had sold two more of its CANDU reactors to Korea Electric Power Corporation (KEPCO). Both heavy water reactors (HWR), using AECL's CANDU 6 design, will be built at KEPCO's Wolsong station, located north of Puson on South Korea's east coast. KEPCO currently operates one 629-MWe CANDU HWR (Unit 1) at the Wolsong station and has another under construction. Unit 2 is scheduled to commence operation in 1997, and the newly purchased Units 3 and 4 will begin commercial operation in 1998 and 1999.

The Korean nuclear program currently includes nine operating reactors totalling 7,243 MWe of capacity, with one reactor under construction and six more in the planning stage. South Korea's long-term plans call for 27 operating reactors by the year 2006.

SKI Orders Precautionary Measures

On September 17, the Swedish Nuclear Safety Inspectorate (SKI) announced that the country's five oldest nuclear plants will not be allowed to operate until corrections are made to each plant's emergency core cooling system (ECCS).

These requirements stem from an an incident at Barsebäck 2, where a piece of pipe insulation fell into a cooling system containment pool, threatening to clog the inlet strainers. While designers had foreseen this possibility, they anticipated having sufficient time to clear the clog before it became severe; however, the clogging occurred much sooner than expected. Had the plant been operating at full power, plant operators would not have had enough time to reverse the flow of coolant and flush out the blockage. Fortunately, at the time of the incident, the Barsebäck plant was operating at marginal power; therefore, interruption of proper circulation of the coolant was not as critical.

SKI is calling for each utility to prove the ECCS currently in place is highly reliable and would ensure safety if such an event were to recur. All five of Sweden's older-generation boiling water reactors (Barsebäck 1 and 2, Ringhals 1, and Oskarshamn 1 and 2) are presently shut down to address the issue and will remain shut down temporarily until precautionary steps can be taken.

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ORGANIZATION OF THE GERMAN NUCLEAR INDUSTRY

Corporate ownership within the German nuclear industry has evolved constantly during the last decade, and recent acquisitions and mergers, reunification of the country, as well as preparation for a unified European power market, have led to many significant changes during the past two years. The country's nuclear industry continues to struggle under an increasingly anti-nuclear political environment, yet nuclear power provided more than one-third of Germany's total electricity generation in 1991.

As in many countries, particularly in western Europe, many German companies involved in different facets of the nuclear industry are interrelated. Usually as a means of horizontal or vertical integration, the country's nuclear utilities own, directly or indirectly, shares in uranium mining projects; conversion, enrichment, and fabrication companies; or other utilities' nuclear power plants. The utilities own partial interests in companies in supporting industries as well, including transportation firms, waste management companies, uranium broker/traders, and nuclear equipment manufacturers (see *Fold-Out Diagram*). While the majority of the companies owned are German, numerous investments are made in non-German firms also.

MAJOR UTILITIES AND CORPORATIONS

Germany's nuclear industry is dominated by only a few major firms: RWE AG, an energy, mining, and construction company, and owner of RWE Energie AG, Germany's largest electric utility; PreussenElektra AG, the second-largest utility, owned by energy giant Veba AG; and Siemens AG, Germany's primary electrical equipment supply corporation. The country's other major nuclear utilities include Bayernwerk AG (BAG), Vereinigte Electrizitätswerke Westfalen AG (VEW), Badenwerk AG, Energie-Versorgung Schwaben AG (EVS), and Hamburgische Electricitäts-Werke AG (HEW). All of these companies are located in and provide service to western Germany. Utility service to eastern Germany is supplied by Vereinigte Energiewerke AG (VEAG), the state-owned corporation. Presently, VEAG is owned by the government, with RWE Energie, PreussenElektra, and BAG controlling operating interests of 35 percent, 35 percent, and 30 percent, respectively. Over time, VEAG and other east German regional utilities will be sold, primarily to existing west German utilities.

RWE AG

RWE has emerged in the last decade to become one of Germany's major corporations. Originally an electric utility based in Essen, Rheinisch-Westfälisches Elektrizitätswerk (officially renamed RWE AG in early 1990), has transformed itself in the past several years into an energy, mining, and construction conglomerate with annual net sales of nearly DM50 billion (US$33 billion).

The company's energy division is led by RWE Energie AG, Germany's largest utility and the fourth-largest utility in Europe, based on total power sold. RWE Energie owns and operates several reactors: 100 percent of the two-unit Biblis station (a 1,146-MWe pressurized water reactor and a 1,240-MWe PWR), and the presently shut down 1,219-MWe Mülheim-Kärlich PWR. RWE Energie also operates the Gundremmingen station (containing two 1,240-MWe boiling water reactors), which is owned by Kernkraftwerk Gundremmingen Verwaltungesellschaft (KGV). KGV leases the power generated by the station back to RWE Energie and BAG. RWE Energie owns 75 percent of KGV, and BAG owns the other 25 percent.

The Mülheim-Kärlich reactor, which began commercial operation in 1987, has been shut down since 1988, due to legal technicalities regarding its operating license. The reactor's license was found to be invalid because the reactor is not sited precisely in the location indicated in the original construction documents. A new license was issued, but was suspended by the ruling administrative court, which also ruled out further appeals. This latter decision was reversed, however, and an appeal of the suspension was finally allowed. If the appeal is successful, RWE hopes to resume operation of the reactor in 1993. In a separate suit, the Mainz district court ruled that the state of Rhineland-Palatinate was partially responsible for the licensing deficiencies that led to the extended shutdown of the reactor, and must compensate RWE Energie for half the costs it has incurred while the reactor has been down. The state could be liable for as much as DM500 million (US$332 million), although it has appealed the decision. Nevertheless, the existing license for Mülheim-Kärlich is just a trial operational license, requiring RWE Energie to obtain a full operating license by early 1994. This necessity could be troublesome, since the Rhineland-Palatinate government responsible for issuing the license is now controlled by the anti-nuclear Social Democratic Party.

RWE Energie owns a controlling interest (68.85 percent) in Schnell-Brüter-Kernkraftwerkgesellschaft (SBK), a company involved in the design, construction, and operation of fast breeder reactors (FBR). SBK owns 100 percent of the now-abandoned Kalkar FBR project and a 16-percent share in NERSA, a consortium of European utilities that owns the Superphénix FBR in France, now shut down.

Rheinbraun AG, based in Cologne, is the principal company of RWE's Mining and Raw Materials Division. Rheinbraun is western Germany's largest producer of brown coal, the country's most important domestic fuel source. Brown coal-fired plants generated 29 percent of the electricity produced throughout Germany in 1991, and more than 80 percent of the electricity generated in eastern Germany. RWE Energie's expertise in the use of brown coal to generate electricity has led it to invest heavily in renovating the power plants of eastern Germany.

In addition to its coal activities for RWE Energie, Rheinbraun owns a 50-percent interest in the uranium mining firm, Uranerzbergbau GmbH. Through its wholly owned subsidiaries, Uranerz owns a 33.3-percent interest in both the Rabbit Lake and Key Lake uranium projects in Canada, and a 25-percent share of Crow Butte in the USA. Rheinbraun also directly owns a 6.25-percent interest in Energy Resources of Australia (ERA).

RWE now owns 100 percent of Nukem GmbH, as a result of its third quarter 1990 purchase from Metallgesellschaft AG of the remaining 10-percent interest. Nukem is primarily a nuclear services company, although several of its businesses, such as its fuel manufacturing division, have been sold in recent years. NUKEM also is a uranium trading and brokerage firm, and controls, through its wholly owned subsidiary Cycle Resources Investment Corporation, a 50-percent interest in the Sheep Mountain Partners uranium project in the USA (a joint-venture with US Energy Corporation).

RWE also controls a 37.5-percent interest (0.5 percent through Nukem) in Uranit GmbH, the German uranium enrichment company. Uranit owns 50-percent of MAN-Uranit, a manufacturer of uranium enrichment centrifuges, as well as one-third of Urenco. Urenco, which is also one-third owned by both BNFL of the UK and UCN of The Netherlands, is one of the world's primary suppliers of enrichment services. Among its three plants, Urenco operates a centrifuge enrichment facility at Gronau, Germany with an annual capacity of 500 thousand SWU.

PreussenElektra AG

PreussenElektra is the eighth-largest utility in Europe and is part of energy conglomerate Veba AG. Veba is a Düsseldorf-based, private-stock company with extensive interests in electricity supply, chemicals, oil, trade, and transportation.

PreussenElektra is one of the principal companies of the Veba group. Based in Hannover, the utility provides wholesale electricity to the states of Schleswig-Holstein and Lower Saxony, as well as portions of the states of Northrhein-Westphalia and Hesse. This service territory, covering much of central and northwestern Germany, includes more than 15 million people. PreussenElektra primarily uses nuclear power and coal-fired plants to generate its electricity; nuclear power accounts for approximately two-thirds of its electric energy. It owns and operates several reactors, including Unterweser, a 1,230-MWe PWR; Würgassen, a 640-MWe BWR; Brokdorf, a 1,326-MWe PWR, Stade, a 640-MWe PWR; and Grohnde, a 1,300-MWe PWR. The Grohnde station, 50-percent owned by the utility Gemeinschaftskraftwerk Weser GmbH (GKW), ranked second in the world in 1991 in total power generated, producing 9,961 GWh (**Table 1**). PreussenElektra also owns interests in the Krümmel and Brunsbüttel nuclear stations that are operated by HEW.

In addition to its domestic electricity production, PreussenElektra owns a 10.5-percent interest in the Swedish utility Sydkraft AB, as a means to improve its access to electricity supplies from Scandinavia.

Table 1
NUCLEAR POWER UNITS IN GERMANY

Units In Operation

Unit	Lead Utility or Fuel Buyer	Capacity (MWe net)	Type	COD[1]	1991 Capacity Factor (percent)	Total 1991 Electricity Generation (GWh net)
Biblis A	RWE[2]	1,146	PWR	1975	70	6,985
Biblis B	RWE	1,240	PWR	1977	37	3,974
Brokdorf	PREAG[3]	1,326	PWR	1986	81	9,459
Brunsbüttel	HEW[4]	771	BWR	1977	57	3,826
Emsland	VEW[5]	1,242	PWR	1988	94	10,263
Grafenrheinfeld	BAG[6]	1,235	PWR	1982	90	9,734
Grohnde	PREAG	1,300	PWR	1985	87	9,961
Gundremmingen B	RWE	1,240	BWR	1984	75	8,099
Gundremmingen C	RWE	1,248	BWR	1985	75	8,201
Isar 1	BAG	870	BWR	1979	89	6,750
Isar 2	BAG	1,310	PWR	1988	85	9,767
Krümmel	HEW	1,260	BWR	1984	70	7,755
Mülheim-Kärlich	RWE	1,219	PWR	1987	—	—
Neckarwestheim 1	GKN[7]	795	PWR	1976	80	5,540
Neckarwestheim 2	GKN	1,230	PWR	1989	89	9,605
Obrigheim 1	KWO[8]	340	PWR	1969	35	1,049
Philippsburg 1	BW/EVS[9]	864	BWR	1980	81	6,166
Philippsburg 2	BW/EVS	1,268	PWR	1985	89	9,863
Stade	PREAG	640	PWR	1972	41	2,288
Unterweser	PREAG	1,230	PWR	1979	60	6,476
Würgassen	PREAG	640	BWR	1975	73	4,105
TOTAL		**22,414**		***(1991 Average:***	**71)**[10]	**139,866**

Units Under Construction

Unit	Lead Utility or Fuel Buyer	Capacity (MWe net)	Type	COD[1]	Percent Complete
Kalkar	SBK[11]	295	LMFBR	Indefinite	100

---

[1] COD = Commercial Operation Date

[2] RWE = RWE-Energie AG

[3] PREAG = PreussenElektra AG

[4] HEW = Hamburgische Elektricitäts-Werke AG

[5] VEW = Vereinigte Elektrizitätswerke Westfalen AG

[6] BAG = Bayernwerk AG

[7] GKN = Gemeinschaftskernkraftwerk Neckar GmbH

[8] KWO = Kernkraftwerk Obrigheim GmbH

[9] BW/EVS = Badenwerk AG/Energie-Versorgung Schwaben AG

[10] Average does not include those units that entered commercial operation or were retired during 1991.

[11] SBK = Schnell-Brüter Kernkraftwerksgesellschaft mbH

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By the end of the year, PreussenElektra plans to complete its second 1,200-MW above-ground transmission connection to Sweden via Denmark. It also plans to begin installing a direct, 600-MW underwater cable through the Baltic Sea, further integrating the electrical supply systems of the two countries.

In the non-nuclear area, Veba announced a major organizational restructuring in early 1992 that placed Veba Kraftwerk Ruhr (VKR), a conventional-power utility, as a wholly owned subsidiary of PreussenElektra. VKR formerly had been separate from PreussenElektra, but now will operate PreussenElektra's 6,000 MW of conventional power capacity. When added to the 672 MW of capacity it operates for RWE Energie and its own 4,191 MW of capacity, VKR has become one of Germany's major utility divisions, consuming more hard coal for electricity generation than any other company.

Like other German nuclear utilities, PreussenElektra has integrated through the industry. It owns a 37.5-percent interest in Uranit, and also owns a 23.7-percent interest in Gesellschaft für Nuklear-Service mbH (GNS), a nuclear transportation and radioactive waste management company.

Urangesellschaft mbH

In the most significant organizational change in the German uranium supply industry this year, Cogema, the French fuel cycle conglomerate, purchased a 70-percent interest in the German uranium trading company Urangesellschaft mbH (UG), from Veba and its affiliates, including PreussenElektra. UG previously had been owned by Veba, PreussenElektra, and Steag AG. The purchase was first announced in January 1992 and was concluded in June. In late August, Cogema announced that it was merging UG with its own uranium marketing intermediary, Interuran (which was 75-percent owned by Cogema). The companies have been merged into one company (still named UG), in which Cogema's wholly owned German subsidiary, Cogema Uran Services GmbH, owns 69.4 percent. PreussenElektra and Steag each own 10.3 percent, and former Interuran shareholders, Badenwerk and EVS, each own five percent.

UG will continue its uranium trading activities, as well as Interuran's long-term marketing efforts. UG also will take the 25-percent interest in the Highland uranium project in the USA that was owned by Interuran. This furthers UG's extensive uranium mining interests, which include shares in Rössing Uranium Ltd. of Namibia, ERA and the Yeelirrie project in Australia, the Kiggavik project in the Northwest Territories of Canada, the Gas Hills project in the USA, and Somaïr in Niger. Interuran's exclusive agreement with the German Ministry of Economics to market Wismut uranium has now been assumed by Cogema. (Wismut SDAG is the former East German national uranium producer now owned by the German government.) UG also has a joint-venture with Techsnabexport of Russia, known as Internexco, that markets uranium and related services from Russia in much of Europe.

Siemens AG

Siemens AG is a major diversified corporation, having activities in such areas as engineering, construction, power generation and transmission, data and information systems, and semiconductors. Due to an aggressive acquisition policy and the tremendous opportunities afforded by German unification, Siemens recently has experienced very strong growth, registering more than DM73 billion (US$48.6 billion) in sales in 1991, with new orders worth DM83 billion (US$54.8 billion) placed during the same year.

One of Siemens' primary divisions is the Power Generation Group, known as KWU (formerly Kraftwerk Union AG). The KWU division oversees all aspects of Siemens construction work on both nuclear and conventional power plants. It also is actively involved in the nuclear fuel fabrication business. Siemens' Brennelementewerk Hanau (BWH) is Germany's primary fuel fabricator of uranium and mixed-oxide (MOX) fuel, supplying more than two-thirds of the fuel elements to German reactors. BWH recently has faced several challenges regarding safety issues raised by anti-nuclear groups. In late December 1991, BWH was forced to shut down its 800 metric ton-per-year uranium fuel fabrication line, when a hydrogen explosion at a nearby non-nuclear plant led to a safety investigation of the hydrogen systems at BWH. Less than a month later, the uranium fabrication line returned to full operation, once the safety of the hydrogen systems were confirmed. However, the MOX fuel facility remains off-line, shut down since June 1991 following a contamination incident at the plant. While the cause of the incident has been determined and systems have been put in place to prevent its recurrence, the MOX line remains shut down, due to challenges to its operating license. The Federal Constitutional Court has heard arguments to determine if the present operating license for the existing MOX plant is valid and if the facility can resume operation, although the case is still pending. Additionally, BWH has been constructing a new MOX facility at the same location. It is more than 90-percent complete, but the anti-nuclear Social Democratic Party controls the state government of Hesse; therefore, the scheduled 1993 operation date for the plant, with an annual capacity of 130 metric tons heavy metal, likely will be postponed due to delays in licensing.

In addition to the facilities at Hanau, Siemens also operates three other fabrication facilities, including a 400-MT BWR fuel facility at Karlstein, Germany. The wholly owned US subsidiary, Siemens Capital Corporation, owns Siemens Power Corporation (SPC), which operates a 700 MT-per-year UO_2 conversion and fabrication plant at Richland, Washington. SPC, in turn, owns Advanced Nuclear Fuels GmbH (ANF), a fabricator that operates a 400 MT-per-year facility at Lingen, Germany. A new UO_2 conversion line is under construction at the Lingen site and is scheduled for completion during first half 1993. SPC is responsible for coordinating and managing uranium supply and plant loading schedules at both plants.

Siemens also owns a 50-percent interest in Nuklearer Versicherungsdienst GmbH (NVD), a fuel cycle insurance company. Nukem owns the other 50 percent of NVD.

In addition to its fabrication business and its primary activities of designing and providing nuclear steam supply systems and reactors, Siemens has formed a joint venture with Framatome, the French nuclear reactor vendor, called Nuclear Power International (NPI). The joint venture was established in April 1989 to coordinate marketing and development of the companies' common PWR technology throughout the world. NPI has submitted, or is preparing, proposals to supply PWRs to several countries, including Hungary, China, India, Taiwan, and Indonesia. The proposals can be for joint ventures, turnkey construction projects, or simply provisions of technology and expertise to construct a reactor with as much local involvement as possible. NPI is developing a family of standardized reactors, ranging in size from 600 MWe to 1,400 MWe, to market as a common product of the joint-venture partners.

Bayernwerk AG

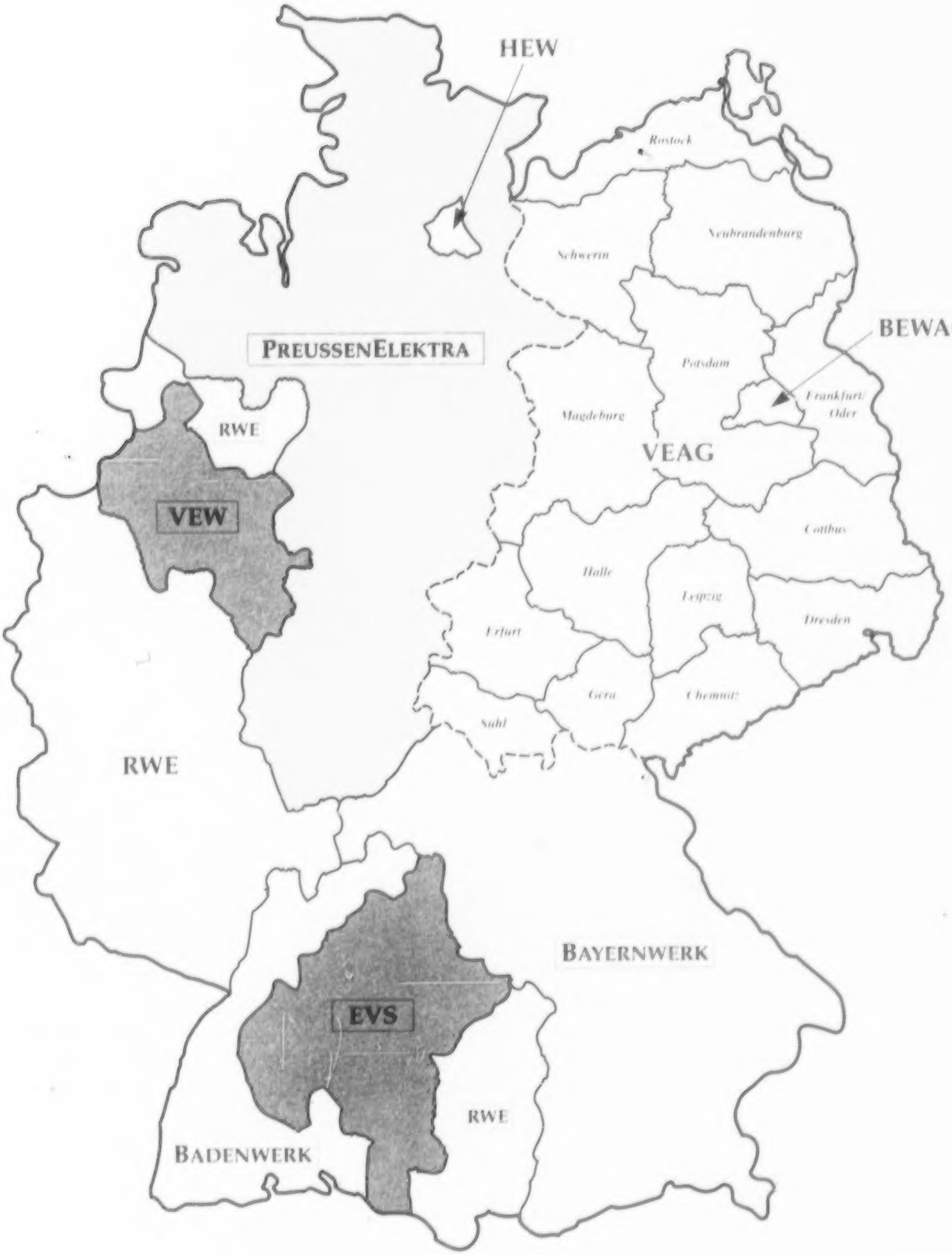
The third company of Germany's "Big Three" utilities is Bayernwerk AG. This Munich-based corporation services the state of Bavaria and other areas of southeastern Germany. BAG is majority-owned by the state of Bavaria and several counties in the region. VIAG AG, a private industrial company with interests in chemicals and aluminum production and fabrication, owns the balance of 38.8 percent. BAG operates three reactors and has a minority interest in two other reactors for the nuclear portion of its electricity supply base. BAG operates and owns 100 percent of the 1,235-MWe PWR at Grafenrheinfeld. This plant recently was praised by an IAEA Operations Safety Review Team (OSART) following a visit in December 1991. The plant, labeled "impressive" and "well designed and well managed", has an average lifetime availability factor of nearly 85 percent. BAG also operates and owns a 50-percent interest of Unit 1 at the Isar nuclear station, an 870-MWe BWR; it operates and effectively controls a 50-percent interest at Isar 2 (a 1,310 MWe PWR) as well. A local utility, Isar-Amperwerke AG, owns the other 50 percent of Unit 1 and 25 percent of Unit 2. BAG also owns 25-percent of the Gundremmingen nuclear station, sharing the twin 1,240-MWe BWR station with RWE Energie.

VEW

Dortmund utility VEW services a densely populated area in Germany's industrial Ruhr region, situated between the service areas of the country's two largest utilities, RWE Energie and PreussenElektra (**Figure 1**). VEW owns 75 percent of the Emsland nuclear station, a 1,242-MWe PWR that generated 10,263 GWh in 1991, more than any other reactor in the world. VEW also owns a 31-percent interest in Hochtemperatur-Kernkraftwerk GmbH (HKG), the owner/operator of THTR-300, Germany's prototype thorium high-temperature gas-cooled reactor. After numerous failed requests to the federal government for funding to continue operating the reactor, HKG applied for a decommissioning license and shut down THTR-300 in 1991, when its supply of fuel was depleted.

Among VEW's diversified interests is a thirty-percent share in Ruhrkohle AG, Germany's largest hard coal producer. Ruhrkohle (37-percent owned by Veba) owns 71 percent of Steag, who, in turn, owns 10.3 percent of UG.

Figure 1
UTILITY SERVICE REGIONS IN GERMANY


HEW
Rostock
Schwerin
Neubrandenburg
PREUSSENELEKTRA
BEWAG
Potsdam
Frankfurt/
Oder
RWE
Magdeburg
VEAG
VEW
Cottbus
Halle
Leipzig
Dresden
Erfurt
Gera
Chemnitz
Suhl
RWE
BAYERNWERK
EVS
RWE
BADENWERK

Badenwerk AG

From Karlsruhe, the utility Badenwerk AG services southwestern Germany. Owned by the state of Baden-Württemberg, as well as regional hydroelectric utilities, private companies, and private shareholders, Badenwerk has taken advantage of its common borders with France and Switzerland, securing interests in nearby reactors beyond the boundaries of Germany. Badenwerk owns a 7.5-percent share of the 990-MWe BWR at Leibstadt, Switzerland, and also has the rights to a 17.5-percent share of the electricity production from Electricité de France's (EdF) two-unit Fessenheim station and a five-percent share of the production from EdF's Cattenom station. Additionally, Badenwerk has a long-term baseload power contract with EdF that stretches through the year 2015. The contract has allowed Badenwerk to postpone a decision on construction of a new baseload power plant until after the year 2000, despite a 2.7 percent annual growth rate in power demand. Badenwerk estimates that as much as 20 percent of its power will be imported from France or Switzerland by the year 2001. Presently, 57.5 percent of Badenwerk's electricity supply is generated by nuclear power.

Badenwerk's interests extend to domestic nuclear stations as well. It owns 50 percent of Kernkraftwerk Philippsburg (KKP), which operates a 864-MWe BWR and a 1,268-MWe PWR, and 28 percent of the Obrigheim 340-MWe PWR, operated by EVS. The Obrigheim station has had several challenges to its license and was forced to shutdown in mid-1990, the result of a Mannheim Administrative Court ruling stating the plant could not operate on the basis of its preliminary operating license issued in 1968. However, in June 1991, the Federal Administrative Court overturned the lower court's ruling, concluding that the initial operating license, combined with its eight regulatory appendices, allowed for continued operation of the plant; however, the high court also ruled that the station could not continue to operate indefinitely on the basis of its preliminary license. The plant resumed operation in August 1991, and in August 1992, Baden-Württemberg's Minister of Environment issued Obrigheim an operating license that was contingent upon completion of a probabilistic safety analysis prior to the end of 1993. The analysis must be completed and approved or Obrigheim's operating license could be revoked.

Badenwerk continues to look for ways to cooperate with other companies to secure power supplies and to become a major factor in Germany's electricity sector. The company is actively pursuing ownership interests in the regional utilities of eastern Germany. Badenwerk and EVS, who attempted to merge in 1989 but were prohibited by the federal government, have resumed discussions on that issue, since conditions in the German power sector have changed significantly following reunification. The two utilities likely will propose a merger in the near future, creating another large utility in southern Germany. In the long-term, Badenwerk may seek closer cooperation with BAG as well.

EVS

The other major southern German utility is the Stuttgart-based Energie-Versorgung Schwaben AG. EVS owns a fifty-percent interest in the Philippsburg station (shared with Badenwerk), and 35 percent of the Obrigheim station, which it operates. EVS' share of power produced at these two stations constitutes almost 50 percent of the utility's total annual electricity generation. EVS recently signed a new long-term contract with the Austrian utility Tiroler Wasserkraftwerke for exchange of electricity supplies. The Austrian utility will provide 350 MW of peak-load capacity to EVS, and in return, EVS will supply a reciprocal amount of base-load capacity. The contract extends through the year 2017. EVS also owns a small interest in Gemeinschaftskernkraftwerk Neckar GmbH (GKN), the operating utility of the Neckarwestheim station. EVS owns a five-percent interest in UG, acquired as the result of the merger of UG and Interuran.

HEW

Hamburgische Electricitäts-Werke AG provides electricity to the city of Hamburg and the surrounding region in northern Germany. Shares of HEW stock are publicly traded on the regulated share markets of Frankfurt, Hannover, and Amsterdam. Hamburger Gesellschaft für Beteiligungsverwaltung mbH, a wholly owned subsidiary of the city of Hamburg, controls 71.4 percent of the HEW shares.

HEW owns interests in four German nuclear power stations and operates two of those stations. The company owns 20 percent of the Brokdorf station and 33.3 percent of the Stade station, both of which are operated by

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OVERSIZE FOLDOUT(S) FOUND HERE IN THE PRINTED EDITION OF THIS VOLUME ARE FOUND FOLLOWING THE LAST PAGE OF TEXT IN THIS MICROFICHE EDITION.

SEE FOLDOUT NO 1

Legend for Diagram
GERMAN NUCLEAR INDUSTRY

Abbreviation	Full Name (description)
AG	Aktiengesellschaft (incorporated company)
ANF	Advanced Nuclear Fuels GmbH (fabricator)
BAG	Bayernwerk AG (utility)
BNFL	British Nuclear Fuels plc (UK fuel cycle company)
BWH	Brennelementewerk Hanau (uranium and MOX fuel fabrication)
EVS	Energie-Versorgung Schwaben AG (utility)
GfE	Gesellschaft für Energiebeteiligung
GKH	Gemeinschaftskraftwerk Hattingen GmbH
GKN	Gemeinschaftskernkraftwerk Neckar GmbH (utility)
GKW	Gemeinschaftskraftwerk Weser GmbH (utility)
GmbH	Gesellschaft mit beshränkter Haftung (limited liability company)
GNS	Gesellschaft für Nuklear-Service mbH (transportation and radioactive waste disposal)
HEW	Hamburgische Electricitäts-Werke AG (utility)
HKG	Hochtemperatur - Kernkraftwerk GmbH (owner/operator of THTR-300)
KGV	Kernkraftwerk Gundremmingen Verwaltungesellschaft
KKL	Kernkraftwerk Leibstadt AG (Swiss utility)
KKP	Kernkraftwerk Philippsburg GmbH (utility)
KWO	Kernkraftwerk Obrigheim GmbH (utility)
KWU	Siemens Power Generation Group (formerly Kraftwerk Union AG)
NERSA	Centrale Nucléaire Européenne à Neutrons Rapides SA (European utility consortium)
NPI	Nuclear Power International (nuclear industry marketing joint venture)
NVD	Nuklearer Versicherungsdienst GmbH (fuel cycle insurance company)
NWE	Neckarwerke Esslingen AG (utility)
OEW	Zweckverband Oberschwäbische Elektrizitätswerke GmbH (association of municipal hydroelectric utilities)
RWE	RWE AG (parent company of the utility RWE-Energie)
SBK	Schnell-Brüter-Kernkraftwerksgesellschaft mbH (breeder reactor management company)
SPC	Siemens Power Corporation (US fabricator)
THTR-300	Thorium high-temperature gas-cooled reactor
TWS	Technische Werke der Stadt Stuttgart
UCN	Ultra-Centrifuge Nederlands N.V. (Dutch uranium enrichment corporation)
UG	Urangesellschaft mbH (uranium trader with mining interests)
Uranit	Uran-Isotopentrennungs GmbH (uranium enrichment company)
VEAG	Vereinigte Energiewerke AG (utility)
VEW	Vereinigte Elektrizitätswerke Westfalen AG (utility)
VIAG	VIAG AG (aluminum and chemical company)
VKR	Veba Kraftwerke Ruhr AG (non-nuclear German utility)
ZEAG	Zement Electricitätswerk Heilbronn AG (cement company)

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PreussenElektra, whose service territory surrounds HEW's service area. HEW owns a 50-percent interest in the Krümmel station and operates the 1,260-MWe BWR; it owns a 66.7-percent share and operates the 771-MWe BWR at Brünsbuttel as well.

GKN

Gemeinschaftskernkraftwerk Neckar GmbH is owned by a group of regional utilities and distributing companies, as well as the German federal railroad. GKN operates the two-unit Neckarwestheim station that consists of Unit 1, a 795-MWe PWR that began operation in 1976, and Unit 2, a 1,268-MWe PWR that began commercial operation in 1989. Unit 2 is the last of three Convoy PWRs designed and built in Germany by Siemens' KWU division.

Another owner of GKN is the utility EVS, which holds a 9.1-percent interest based on nominal capital invested. Other owners include the regional companies of Neckarwerke Esslingen AG (40.9 percent) and Technische Werke der Stadt Stuttgart (29.1 percent). The remaining 2.7 percent interest is held by ZEAG, a local cement company. Interestingly, ZEAG previously owned and operated a rock quarry at the location of Neckarwestheim 1, and when approached by GKN to purchase the site, ZEAG negotiated to join as a participant in the project. All of the owners, except EVS, participate in both units; EVS participates only in Unit 2.

EASTERN GERMANY

Prior to German unification in October 1990, western utilities debated how to integrate the electrical generation sectors of each country. Now, two years later, the debate continues and nothing has been finalized. Presently, the utility Vereinigte Energiewerke AG (VEAG) is responsible for all power generation and distribution in eastern Germany, except Berlin. VEAG is 100-percent owned by the Treuhandanstalt, the trust agency established to handle the eventual privatization of all businesses and property of the former East Germany.

Following reunification, RWE Energie, PreussenElektra, and Bayernwerk proposed an ownership structure in which they would share ownership of VEAG. However, some of the smaller west German utilities objected to being shut out, and the proposal was then modified to have the Big Three utilities split 75 percent of VEAG, and the five smaller west German utilities (Badenwerk, VEW, EVS, HEW, and BEWAG—the west Berlin utility) split the remaining 25 percent (**Table 2**). The Big Three utilities have considered selling up to 15 percent of their 75-percent share to non-German utilities. Several utilities have expressed interest, including both US and UK utilities, but the one most actively pursuing the option is EdF. The sale to EdF or other non-German entities would be contingent on the Big Three German utilities being able to purchase a reciprocal interest in the company buying into VEAG. While a letter of interest has been signed with EdF and negotiations are still proceeding intermittently, progress toward finding reciprocal interests acceptable to all parties has been slow.

At this time, these proposed ownership questions have been rendered moot by a suit filed by numerous east German communities. More than 150 local communities in eastern Germany filed suit in July against the Treuhandanstalt, which had approved the VEAG purchase by the eight west German utilities. The local communities appealed to the Federal Constitutional Court that the sale of 100 percent of VEAG to west German utilities would prohibit them from setting up their own municipal utilities and generating and distributing power for their own use. Thus, the sale of VEAG has been stopped until the Court

Table 2
PROPOSED VEAG OWNERSHIP[1]

RWE-Energie PreussenElektra Bayernwerk	75%[2]
Badenwerk	5%
VEW	5%
EVS	5%
HEW	5%
BEWAG[3]	5%
TOTAL	100%

[1] Subject to Federal Court decision and Treuhandanstalt approval. Currently 100-percent owned by the Treuhandanstalt.

[2] Up to 15 percent of the 75 percent shared by the Big Three German utilities could be sold to non-German utilities, such as EdF.

[3] Berliner Kraft und Licht AG (Berlin utility)

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Table 3
PROPOSED EASTERN GERMANY REGIONAL UTILITY OPERATIONAL INTERESTS

REGION — EASTERN GERMANY REGIONAL UTILITY

BERLIN — Berliner Kraft und Licht AG
Proposed New Ownership Structure:
City of Berlin – 50.82%; PreussenElektra – 10%; Electrowerke Berlin – 10%; Others – 29.18%

ROSTOCK — Hanseatische Energieversorgung AG
Proposed New Ownership Structure:
PreussenElektra – 100%

SCHWERIN — West-Mecklenburgische Energieversorgung AG
Proposed New Ownership Structure:
HEW – 51%; City of Schwerin – 26%; Mecklenberg Vorpommern – 23%

NEUBRANDENBERG — Energieversorgung Müritz-Oderhaff AG
Proposed New Ownership Structure:
PreussenElektra – 100%

MAGDEBURG — Energieversorgung Magdebarg AG
Proposed New Ownership Structure:
City of Magdeburg – 54%; VKR – 29%; VEW – 17%

POTSDAM — Markische Energieversorgung AG
Proposed New Ownership Structure.
PreussenElektra – 100%

FRANKFURT-ODER — Oder-Spree Energieversorgung AG
Proposed New Ownership Structure:
PreussenElektra – 90%; RWE – 10%

ERFURT — Energieversorgung Nordthüringen AG
Proposed New Ownership Structure:
BAG – 66.6%; PreussenElektra – 33.4%

HALLE — Mitteldeutsche Energieversorgung AG
Proposed New Ownership Structure:
VEW – 67.2%; Badenwerk – 16.4%; Isar-Amperwerke – 16.4%

LEIPZIG — Westsächsische Energieversorgung AG
Proposed New Ownership Structure:
RWE – 100%

COTTBUS — Energieversorgung Spree-Schwarze Elster AG
Proposed New Ownership Structure:
RWE – 100%

SUHL — Sudthüringer Energieversorgung AG
Proposed New Ownership Structure:
BAG – 100%

GERA — Ostthüringer Energieversorgung AG
Proposed New Ownership Structure:
BAG – 100%

CHEMNITZ — Energieversorgung Südsachsen AG
Proposed New Ownership Structure:
RWE – 65%; BAG – 35%

DRESDEN — Energieversorgung Sachsen Ost AG
Proposed New Ownership Structure:
State of Saxony and local communities – 40%; EVS – 38%; HEW – 22%

reaches a decision on the case, possibly by the end of the year. In the meantime, on an operating basis only, VEAG-Geschäftsbersorgung AG (VEAG-GB) has been established to run the east German electricity system; itis owned by RWE Energie (35 percent), PreussenElektra (35 percent), and Bayernwerk (30 percent). The operating company VEAG-GB will cease to exist once the ownership of VEAG is determined.

Within the service area of VEAG, there are 15 regional utilities, whose future ownership is being negotiated. The regional utilities are all 100-percent owned by the Treuhandanstalt, but many proposals have been made for dividing up ownership among west German utilities. The information given in **Table 3** shows proposed future ownership interests in the east German regional utilities. Note that the West Berlin utility, Berliner Kraft und Licht AG (BEWAG), is not part of the VEAG service area; it is owned by the city of Berlin, PreussenElektra, and other private shareholders. Effective January 1, 1991, BEWAG purchased 100 percent of the East Berlin utility (EBAG), with the approval of the Treuhandanstalt. EBAG was first operated as a wholly owned subsidiary, but was integrated completely into BEWAG earlier this year.

VEAG will be responsible for operating an imported hard-coal power station at Stendal, site of two abandoned nuclear reactors that were in the early stages of construction in the former East Germany. Western Germany's Big Three utilities, as well as EdF, are together planning construction of the new coal-fired station. Construction on the two 750-MWe units is scheduled to begin in 1994 and be complete by 1998. East Germany's primary nuclear station at Greifswald was shut down in early 1991 and plans for the enormous decommissioning task are underway. No new power stations are planned for the Greifswald site.

CONCLUSION

Organization of the German nuclear industry has changed constantly over the past several years, and with the reunification of the country, the integration of eastern Germany will bring even more substantial changes in the near-term. The outcome of the pending suit filed by the east German communities, the progress of negotiations on future ownership of east German utilities (by both German and non-German utilities), and most significantly, the effects of an increasingly anti-nuclear political environment, will determine the future structure of the German nuclear industry. Nevertheless, nuclear power still remains an integral part of the country's energy mix, and the continued good performance of existing reactors will contribute to increased public acceptance and perhaps a revival of nuclear power in Germany.

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URANIUM SUPPLY POTENTIAL OF THE CENTRAL ASIAN REPUBLICS

Dustin J. Garrow, Vice President of NUEXCO Trading Corporation, presented the following speech on the republics of Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan at the International Uranium Seminar sponsored by the US Council for Energy Awareness, on September 21, 1992, at Lake Tahoe, Nevada.

Political, social and economic reforms that culminated in the dissolution of the now former Soviet Union, peeled away the layers of secrecy surrounding uranium production throughout the various republics. What is coming to light in Central Asia is a uranium production history extending back to the early 1900s and a significant future supply potential. Substantial uranium reserves were identified and technologically advanced extraction methods implemented under the Soviet regime.

Just where is Central Asia? The relevant geographic region consists of the republics of Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan (**Figure 1**), and encompasses an area as large as the eleven western states of the United States plus Texas. The fifth Central Asian republic, Turkmenistan, does not produce uranium and therefore will not be discussed.

Central Asian history is a tapestry rich in folklore and conflict. The Silk Road from China traversed the region, branching at Samarkand (in modern-day Uzbekistan) to proceed south into India or west to the Caspian Sea. History records Alexander the Great's arrival in Samarkand in 329 B.C., attesting to its antiquity. Timur (or Tamerlane), considered by some historians to be the greatest conqueror the world has ever known, established Samarkand as the capital of an empire which, by the late 1300s, stretched north from India to the Aral Sea.

Ruled by descendants of Genghis Khan, the Golden Horde marched on Central Asia in 1395, but met defeat at the hands of Timur, marking the end of Mongol rule of the region. Further to the north, the Kazakh nation was formed in the mid-15th century when two sons of Barak Khan of the White Horde (Mongol Empire) broke away from the Khan of the Uzbeks, Abul Khayr.

During the mid-16th century, modern day Kazakhstan became the battle ground for the armies of Ivan the Terrible as he waged successful wars against the Khanates of Kazan and Astrakhan.

Russian influence spread into Central Asia in the first half of the 1800s, as St. Petersburg (seat of Romanov authority) strove to expand its presence south toward China.

Having descended principally from nomadic tribes that inhabited the region for centuries, the Central Asians are a fiercely independent people. For example, for several years after the Russian Revolution of 1917, the Central Asians waged a heated, but ultimately futile, guerrilla war against the new Soviet regime. The republics were gradually absorbed into the Soviet Union and given varying degrees of status. "Union Republic" status was conferred on the Central Asian republics between 1924 (Uzbekistan) and 1936 (Kazakhstan and Kyrgyzstan).

LAND AREA/POPULATION/ECONOMY

The four Central Asian Republics comprise an area of approximately 1,353,650 square miles (3,505,900 square kilometers), representing about 15.6 percent of the total area of the former Soviet Union (**Table 1**).

According to the latest census, the four republics contain 46.7 million people, 16.1 percent of the total former Soviet Union (**Figure 2**). The nationality composition of each republic understandably reflects its principal ethnic grouping; however, Russians are a significant presence in Kazakhstan and Kyrgyzstan.

Trade data for the years 1991-1992 clearly indicate recent economic degradation following the implementation of radical economic, social, and political changes (**Table 2**). Exports from the four republics declined by more than

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Figure 1
RELATIVE LOCATION OF CENTRAL ASIAN REPUBLICS

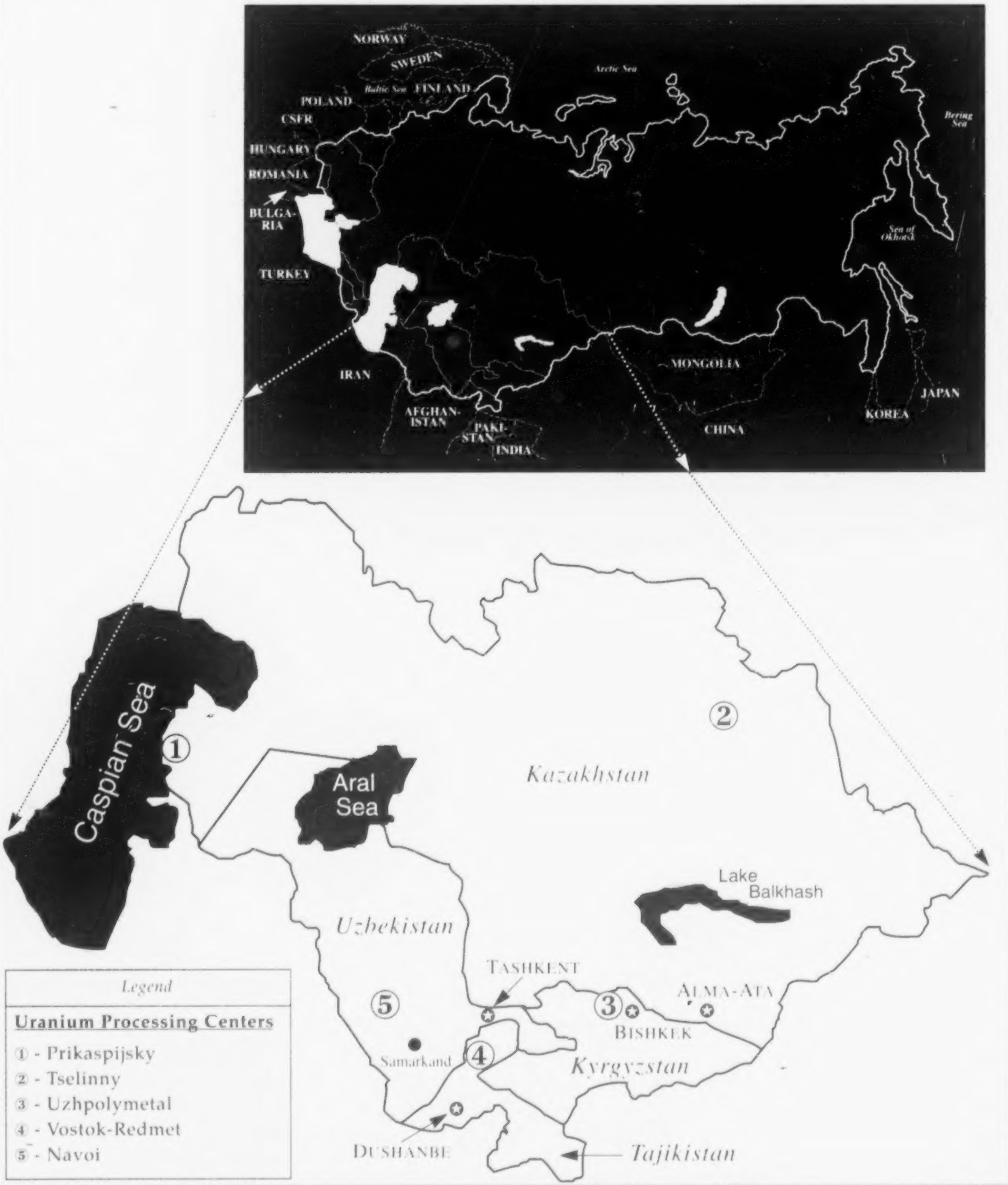
NORWAY
SWEDEN
Baltic Sea
FINLAND
POLAND
CSFR
HUNGARY
ROMANIA
BULGARIA
TURKEY
IRAN
AFGHANISTAN
PAKISTAN
INDIA
Arctic Sea
Bering Sea
Sea of Okhotsk
MONGOLIA
CHINA
KOREA
JAPAN
Caspian Sea
①
Aral Sea
②
Kazakhstan
Lake Balkhash
Uzbekistan
⑤
Samarkand
④
TASHKENT
③
BISHKEK
ALMA-ATA
Kyrgyzstan
DUSHANBE
Tajikistan
Legend
Uranium Processing Centers
① - Prikaspijsky
② - Tselinny
③ - Uzhpolymetal
④ - Vostok-Redmet
⑤ - Navoi

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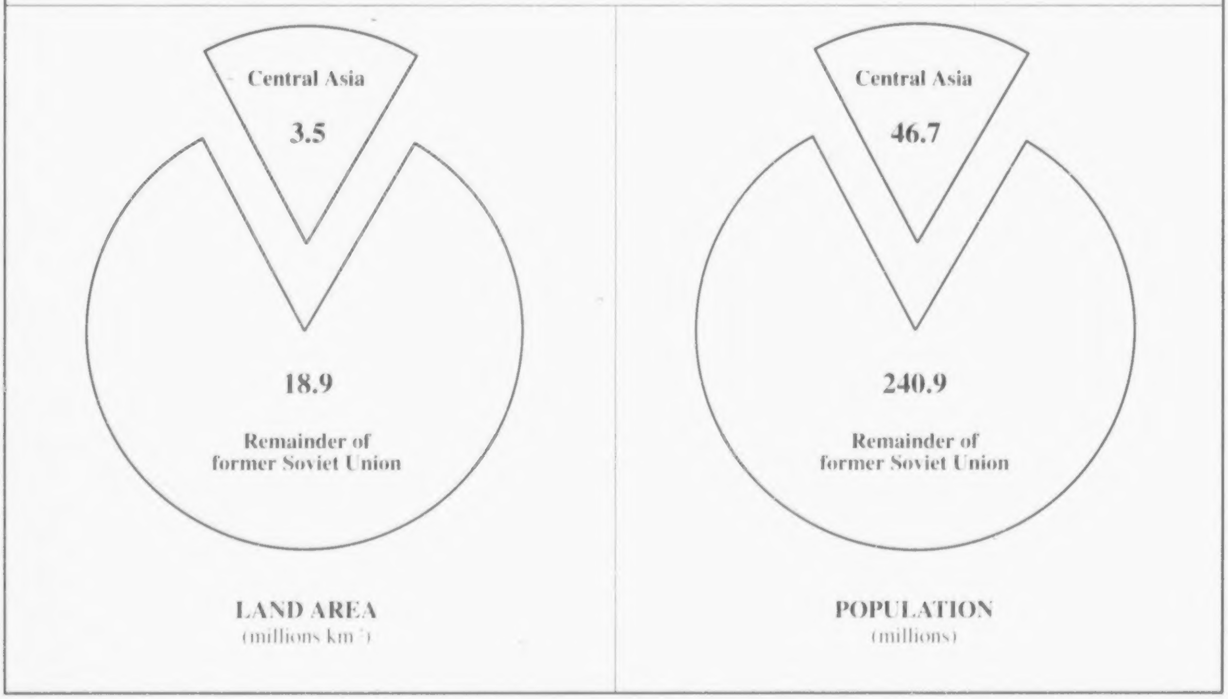
Table 1
TERRITORY AND POPULATION OF CENTRAL ASIAN REPUBLICS
(January 1, 1990)

Republic	Capital	square miles	square km	% of former Soviet Union	Population (millions)	% of former Soviet Union
KAZAKHSTAN	Alma-Ata	1,049,200	2,717,300	12.1	16.7	5.8
KYRGYZSTAN	Bishkek	76,600	198,500	0.9	4.4	1.5
TAJIKISTAN	Dushanbe	55,250	143,100	0.6	5.3	1.8
UZBEKISTAN	Tashkent	172,600	447,000	2.0	20.3	7.0
TOTAL	**—**	**1,353,650**	**3,505,900**	**15.6**	**46.7**	**16.1**

Figure 2
LAND AREA AND POPULATION OF THE CENTRAL ASIAN REPUBLICS



32 percent, while imports fell by more than 42 percent. While these statistics are based on the official commercial exchange rate (1.7 rubles = US $1.00), the relative change is instructive.

Economic development throughout the Central Asian republics clearly lags the average for the former Soviet Union. The four republics rank as some of the poorest within the former Soviet Union, as indicated by per capita estimates of Gross National Product (**Table 3**).

URANIUM RESOURCES

According to published reports, uranium minerals were first discovered in the early 1800s in the territory of Russia near Ekaterinburg in the central Ural mountains. The earliest uranium mining in the Russian Empire took place during 1904-1914 in the Fergana Basin of eastern Uzbekistan where vanadium-uranium ore was recovered. The majority of this ore was shipped to St. Petersburg for beneficiation and radium recovery.

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Table 2
TRADE STATISTICS — 1990-1991
(Million US $)[1]

	EXPORT			IMPORT		
Republic	**1990**	**1991**	**% Change**	**1990**	**1991**	**% Change**
KAZAKHSTAN	1,293.8	796.7	-38.4	2,792.4	1,692.4	-39.4
KYRGYZSTAN	76.5	46.9	-38.7	1,000.5	573.9	-42.6
TAJIKISTAN	480.0	275.3	-42.6	8,585.9	4,687.9	-45.4
UZBEKISTAN	1,015.6	665.5	-34.5	2,351.9	1,361.4	-42.1
TOTAL	**119,838.3**	**81,418.9**	**-32.1**	**137,628.4**	**79,230.1**	**-42.4**

[1] Based on official conversion rate of 1.7 rubles = 1 dollar.

Uranium exploration activities in the former Soviet Union were conducted under the auspices of the Ministry of Geology of the USSR. Further coordination was achieved at the republic level by such entities as the Volkov Production and Geological Association, located at Alma-Ata, which had responsibility for all uranium exploration activities in Kazakhstan and Kyrgyzstan.

The Moscow government began a systematic uranium exploration program immediately following World War II. Initial discoveries occurred in Central Asia.

Geologic information regarding the uranium resources of the CIS are becoming increasingly available. An August 1991 paper presented to the International Atomic Energy Agency (IAEA), co-authored by several recognized Soviet uranium experts ("Uranium Resources of the Union of Soviet Socialist Republics", Laverov, N.P., et al.), provides the most comprehensive treatment of the subject available thus far.

As shown in **Table 4 & Figure 3**, Central Asian republics contain almost 60 percent of the low-cost uranium resources in the former Soviet Union—less than $80 per kgU or $30 per pound U_3O_8. Known uranium resources in this cost category aggregate an estimated 265,900 tonnes U—more than 57 percent of the national total.

Table 3
GROSS NATIONAL PRODUCT (GNP) PER CAPITA, FOR EACH REPUBLIC

Republic	GNP per Capita (as % of Soviet Average)
Kazakhstan	71
Kyrgyzstan	56
Tajikistan	45
Uzbekistan	50

The Kyzylkum region of Uzbekistan (Kyzl Kum Desert) represents the highest potential for future low-cost uranium production, based on the extensive application of solution mining technology.

URANIUM PRODUCTION FACILITIES

Uranium production in the former Soviet Union was under the oversight of the Ministry of Atomic Energy and Industry (MAEI), located in Moscow. The actual production of natural uranium concentrates was carried out by "kombinats" (enterprises), which developed integrated industrial complexes within the former Soviet Union. The kombinats continue to have far-reaching responsibilities, incorporating not only industrial output but, in addition, social infrastructure (health services, education, recreation) and, in many cases, housing for the employees of the kombinat and associated support personnel.

The Central Asian region hosts five major uranium production centers (Figure 1). These beneficiation facilities are integrated into processing plants whose output, in some cases, ranges from consumer products to petrochemicals and heavy manufacturing.

Total annual uranium production capability for the region equals 22.0-23.5 million pounds U_3O_8 (8,500-9,000 MTU as U_3O_8) as shown in **Table 5 & Figure 4**. However, recent production levels have been below the nominal capability. (The Uranium Institute estimates 1991 production from the four-republic region as 6,700 MTU, or approximately 17.4 million pounds U_3O_8).

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Table 4
URANIUM RESOURCES OF THE CENTRAL ASIAN REPUBLICS
– Recoverable at Costs Less Than $80/KgU –

(Thousand Metric Tons of Uranium)

Area	Known Resources	Est. Additional Resources	Prognosticated Resources
KARAMAZAR	20.0	-	-
KOKCHETAVSK	72.4	9.2	-
KYZYLKUM	155.6	106.0	100.0
PRIBALKHASH	17.9	50.0	50.0
TOTALS:			
CENTRAL ASIA	**265.9**	**165.2**	**150.0**
FORMER SOVIET UNION	465.0	325.8	200.0

Source: "Uranium Resources of the Union of Soviet Socialist Republics", Laverov, N.P., et al., presented before the IAEA Technical Committee Meeting on New Developments in Uranium Exploration, Resources, Production and Demand, 26-29 August 1991.

The region's uranium production plants are listed in Table 5 and are discussed below by republic.

Kazakhstan

The Prikaspijsky (Caspian) Mining and Metallurgical Kombinat, located on the eastern shore of the Caspian Sea near the city of Shevchenko, operates two open-pit mines developed during the mid-1960s. Uranium exploration commenced in 1956, and an underground test mine was constructed in 1959. Natural uranium concentrates are produced, in conjunction with phosphoric acid (P_2O_5), and rare earths also are extracted from the phosphoric ores.

Figure 3
URANIUM RESOURCES OF THE CENTRAL ASIAN REPUBLICS
(recoverable at costs less than $80/kgU)

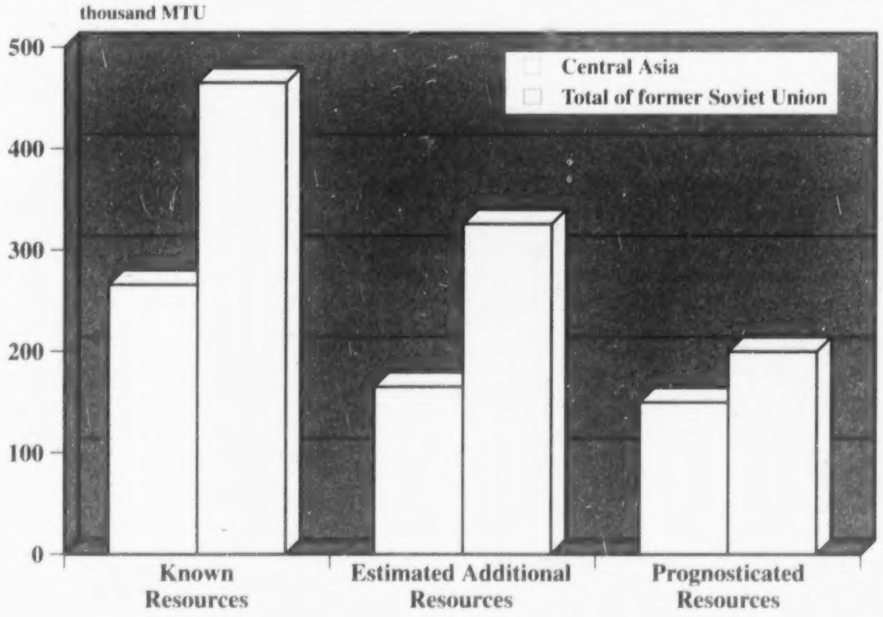

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Table 5
CENTRAL ASIAN REPUBLICS –
URANIUM PRODUCTION FACILITIES

REPUBLIC Processing Entity	Location	Est. Annual Capacity (Thousand lbs U_3O_8)	Associated Mining District
KAZAKHSTAN			
Prikaspijsky (Caspian) Mining and Metallurgical Kombinat	Shevchenko	3,000	Zacaspiysk (Caspian)
Tselinny Mining and Chemical Kombinat	Stepnogorsk	3,000	Kokchetavsk
KYRGYSTAN			
Uzhpolymetal Mining and Metallurgical Kombinat	Bishkek (Kara Balta)	5,000	Pribalkhash (Lake Balkhash)
TAJIKISTAN			
Vostok-Redmet (formerly Leninbad Mining and Metallurgical Kombinat)	Chkalovsk	4,500	Currently receives uranium ore/slurry from mines in Kazakhstan and Uzbekistan
UZBEKISTAN			
Navoi Mining and Metallurgical Kombinat	Navoi	8,000	Kyzylkum (Kyzyl Kum Desert)

A series of underground uranium mines provide ore to the Tselinny Mining and Chemical Kombinat, located near the city of Stepnogorsk in northeastern Kazakhstan (southern edge of the West Siberian plain). The associated mines were developed in several phases beginning in the mid-1950s. Uranium ore is delivered by rail to the processing facility at Stepnogorsk.

The Kazakhstan State Atomic Power, Engineering, and Industry Corporation (known as KATEP), headquartered in the capital of Alma-Ata, was formed recently as a production organization to coordinate uranium-related activities within the republic.

Kyrgyzstan

Uranium production takes place under the auspices of the Uzhpolymetal Mining and Metallurgical Kombinat, situated at Kara Balta, outside the capital city of Bishkek (formerly Frunze). The kombinat was formed in 1951 to exploit the uranium deposits of Kazakhstan and Kyrgyzstan. A conventional uranium mill was commissioned at Kara Balta in 1955.

Production of slurry from solution mining developments was initiated in the late-1970s, as local conventional reserves reached depletion. The kombinat currently operates two primary and one satellite in-situ leaching (ISL) facilities in south-central Kazakhstan (near the city of Zhuantobe).

Tajikistan

Vostok-Redmet (formerly the Leninabad Mining and Metallurgical Kombinat), located at Khodjent in northeastern Tajikistan operates a conventional uranium mill. The hydrometallurgical plant processes ore produced from an open-pit mine in Uzbekistan (15 percent), as well as ISL slurry received from mines in Kazakhstan and Uzbekistan (85 percent).

Uzbekistan

The Navoi Mining and Metallurgical Kombinat was established in 1958 in order to develop the uranium reserves of Uzbekistan. The uranium beneficiation facility (designated Plant 1) entered operation in 1964.

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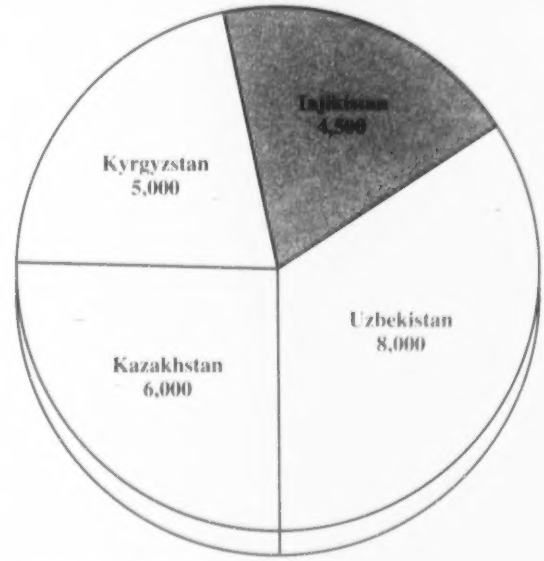
Figure 4
ANNUAL URANIUM PRODUCTION CAPACITY OF THE CENTRAL ASIAN REPUBLICS
(thousand pounds U_3O_8)



The kombinat has produced uranium ores from both conventional sources (underground and open-pit mines) as well as solution mines. Conventional mines are either being phased-out (underground) or are scheduled to be decommissioned by the mid-1990s (open-pit). Future uranium production will focus primarily on solution mines located at Uchkuduk and Nurabat.

EXTRACTION TECHNOLOGY

As indicated in the previous section, uranium mining technologies used in Central Asia include both conventional (open-pit and underground) as well as solution mining (in-situ leaching). Representing less than 10 percent of regional output, one Kazakh facility produces U_3O_8 from phosphate rock.

Conventional mining is declining in importance. However, open-pit and underground mines did provide approximately one-third of 1991 uranium production.

The Soviets developed an indigenous solution mining technology during the 1960s and 1970s. Significant ISL mining takes place in Kazakhstan and Uzbekistan, representing more than 55 percent of the four-republic region's uranium production in 1991. Solution mining's contribution to regional output may approach 90 percent by the mid-1990s.

TRANSPORTATION OF URANIUM CONCENTRATES

Historically, the central Soviet government controlled uranium concentrates shipments into Russia for immediate use or stockpiling. Increased interest in U_3O_8 exports resulted in further evaluation of alternate transportation routing and modes.

Due to the centrally planned nature of the Soviet Union infrastructure, coupled with military-oriented concerns, transportation of strategic commodities such as uranium concentrates has been closely-monitored. The principal port through which uranium is exported remains St. Petersburg, requiring internal rail transport of thousands of kilometers from Central Asia. Rail links through neighboring countries such as China are impractical at the present time.

Air transport, while technically feasible, does not appear viable at the present time, because of escalating fuel costs and unresolved political issues such as overflight and landing rights. This situation may improve in the future, depending upon the evolution of relations between the Central Asian republics and other nations with regional interests.

CONCLUSION

In closing, I just want to say that the dissolution of the Soviet Union ushered in a new era for the Central Asian republics. Virtually overnight, the political and economic underpinnings of these lesser-developed nations were thrown into a state of flux.

During the post-World War II period, uranium production emerged as an important component of Central Asian resource development. Significant strides were made in uranium exploration/resource identification, extraction technology development, and processing facility construction. Entire cities came into being, based principally on the mining and beneficiation of uranium. The Central Asian republics represent a substantial future source of natural uranium concentrates for Western World reactors.

NUCLEAR INDUSTRY CALENDAR

1992

Oct. 11-16 ***USCEA Training Seminar on the Fundamentals of Nuclear Power***
(Georgetown University Conference Center, Washington, DC).
Sponsored by the U.S. Council for Energy Awareness
Contact: USCEA Conference Office, 202-293-0770; Telex: 7108249602; Fax: 202-785-4113
Mail: 1776 "I" Street NW, Suite 400, Washington, DC 20006-3708

Oct. 18-22 ***AMC Mining Convention*** (Las Vegas, Nevada).
Sponsored by the American Mining Congress
Contact: AMC Convention Office, 202-861-2800; Fax: 202-861-7535

Oct. 19-23 ***International Symposium on Geological Disposal of Spent Fuel, High-level and Alpha-bearing Wastes***
(Antwerp, Belgium).
Sponsored by the International Atomic Energy Agency
Contact: IAEA Conference Service Section, P. O. Box 100, A-1400 Vienna, Austria

Nov. 9-10 ***Financial Times/Power in Europe World Electricity Conference*** (Hotel Inter-Continental, London, UK).
Contact: FT Conferences, 071-925-2323; Fax: 071-925-2125
Mail: 126 Jermyn Street, London SW1Y 4UJ, United Kingdom

Nov. 15-18 ***International Nuclear Energy Forum "A Shrinking World, Expanding Horizons"***
(Fairmont Hotel, Chicago, Illinois).
Sponsored by the U.S. Council for Energy Awareness
Contact: USCEA Conference Office, 202-293-0770; Telex: 7108249602; Fax: 202-785-4113
Mail: 1776 "I" Street NW, Suite 400, Washington, DC 20006-3708

Nov. 15-20 ***American Nuclear Society Winter Meeting*** (McCormick Center Hotel, Chicago, Illinois).
Contact: ANS Meetings Department, 708-352-6611

Nov. 22-24 ***2nd International Conference on CANDU Maintenance*** (Holiday Inn On King, Toronto, Canada).
Sponsored by the Canadian Nuclear Association and Canadian Nuclear Society
Contact: CANDU Conference, 416-823-9040; Fax: 416-823-6120
Mail: 2251 Speakman Drive, Mississauga, Ontario, Canada L5K 1B2

Dec. 10-11 ***18th Annual Energy Daily Conference "Beyond The National Energy Strategy"***
(Hyatt Crystal City, Arlington, Virginia)
Contact: King Communications Group, Inc. (Lauren or Karen), 202-662-9278; Fax: 202-662-9719
Mail: 627 National Press Building, Washington, DC 20045

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NUCLEAR INDUSTRY CALENDAR

1993

Feb. 28-Mar. 3 *Nuclear Insurance Conference* (Le Meridien at Coronado, San Diego, California).
Sponsored by the U.S. Council for Energy Awareness
Contact: USCEA Conference Office, 202-293-0770; Telex: 7108249602; Fax: 202-785-4113
Mail: 1776 "I" Street NW, Suite 400, Washington, DC 20006-3708

Mar. 21-24 *Fuel Cycle Conference '93* (Lowes Anatole Hotel, Dallas, Texas).
Sponsored by the U.S. Council for Energy Awareness
Contact: USCEA Conference Office, 202-293-0770; Telex: 7108249602; Fax: 202-785-4113
Mail: 1776 "I" Street NW, Suite 400, Washington, DC 20006-3708

May 16-18 *INFO '93 Conference* (Don Cesar Hotel, Tampa, Florida).
Sponsored by the U.S. Council for Energy Awareness
Contact: USCEA Conference Office, 202-293-0770; Telex: 7108249602; Fax: 202-785-4113
Mail: 1776 "I" Street NW, Suite 400, Washington, DC 20006-3708

Sept. 28-30 *Crisis/Emergency Information Planner's Workshop* (Westin William Penn Hotel, Pittsburg, Penn.).
Sponsored by the U.S. Council for Energy Awareness
Contact: USCEA Conference Office, 202-293-0770; Telex: 7108249602; Fax: 202-785-4113
Mail: 1776 "I" Street NW, Suite 400, Washington, DC 20006-3708

Oct. 3-6 *Uranium Seminar '93* (Westin La Paloma Hotel, Tucson, Arizona).
Sponsored by the U.S. Council for Energy Awareness
Contact: USCEA Conference Office, 202-293-0770; Telex: 7108249602; Fax: 202-785-4113
Mail: 1776 "I" Street NW, Suite 400, Washington, DC 20006-3708

Oct. 3-7 *INC 93 (International Nuclear Congress and Exhibition) "Towards a Better Future"*
(Sheraton Centre, Toronto, Canada).
Sponsored by the Canadian Nuclear Association and Canadian Nuclear Society
Contact: INC'93 Conference, 416-823-9040; Fax: 416-823-6120
Mail: 2251 Speakman Drive, Mississauga, Ontario, Canada L5K 1B2

Nov. 14-17 *Nuclear Energy Forum* (Westin St. Francis Hotel, San Francisco, California).
Sponsored by the U.S. Council for Energy Awareness
Contact: USCEA Conference Office, 202-293-0770; Telex: 7108249602; Fax: 202-785-4113
Mail: 1776 "I" Street NW, Suite 400, Washington, DC 20006-3708

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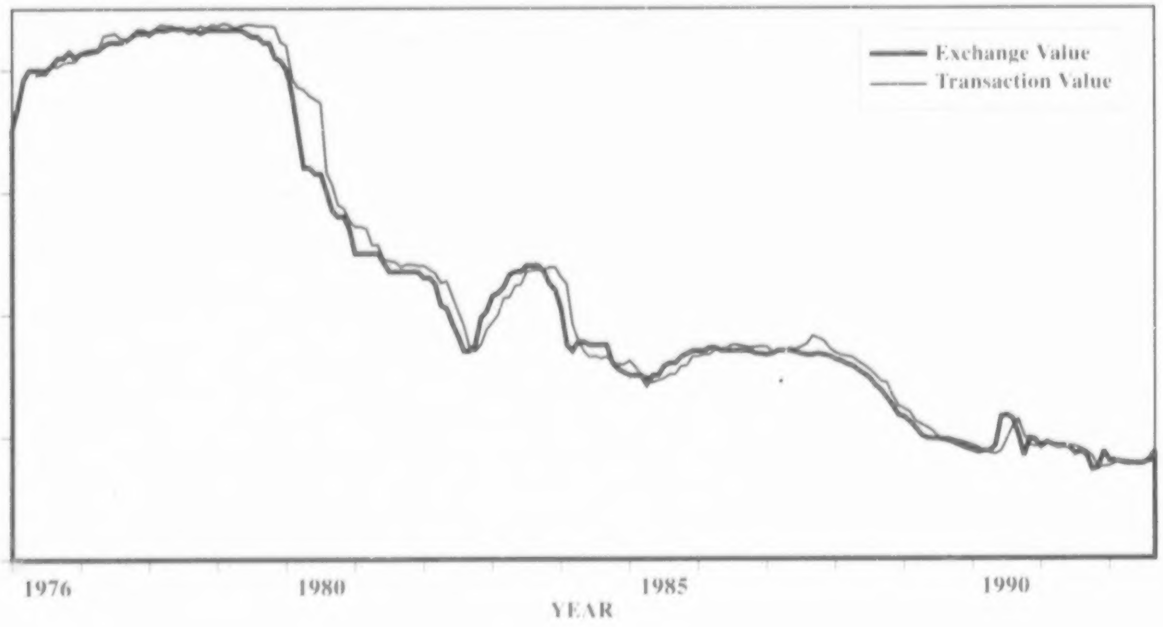
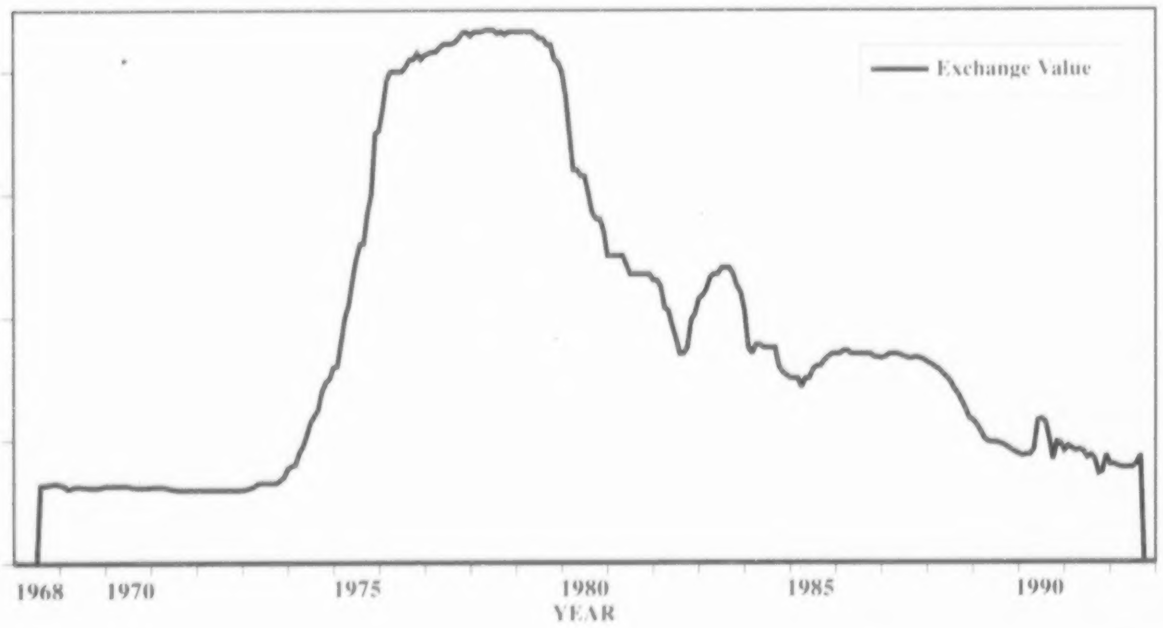
NUEXCO HISTORICAL EXCHANGE VALUE AND TRANSACTION VALUE

(in US dollars per pound U_3O_8)





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HISTORICAL MARKET VALUES

Exchange Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	9.80	9.70
1991	9.10	9.50	9.30	9.10	9.20	9.05	8.55	8.75	8.40	7.25	7.40	8.75
1992	8.00	8.00	7.85	7.75	7.75	7.75	7.75	8.05	**8.75**			

US Premium (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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HISTORICAL MARKET DATA

UF_6 Values

Determined as of the last day of the month indicated ($US/kg U as UF_6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29.50	24.75	28.75	28.75
1991	27.50	27.75	27.50	27.25	27.60	27.25	25.75	26.25	25.50	22.75	22.75	26.00
1992	24.50	24.25	24.00	23.75	23.60	23.60	23.50	24.25	**26.00**			

US Premium (Relative to the UF_6 Value)

Determined as of the last day of the month indicated ($US/kg U as UF_6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

Conversion Values

Determined as of the last day of the month indicated ($US/lb U as UF_6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
1991	1.45	1.45	1.45	1.45	1.50	1.50	1.50	1.60	1.55	1.55	1.55	1.55
1992	1.60	1.60	1.60	1.60	1.60	1.50	1.50	1.50	**1.40**			

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Transaction Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	9.30	9.15
1991	9.40	9.45	9.35	9.30	9.30	9.20	9.15	8.95	8.70	8.35	7.45	7.50
1992	7.55	7.80	7.95	7.90	7.85	7.80	7.75	7.85	**7.95**			

SWU Values

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	51	51
1991	51	50	52	52	54	59	66	67	67	68	68	70
1992	71	70	69	67	65	65	66	66	**68**			

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Loan Rates

Determined as of the last day of the month indicated (Percent per Annum)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1991	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.00
1992	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	**3.00**			

* Float with Prime Rate

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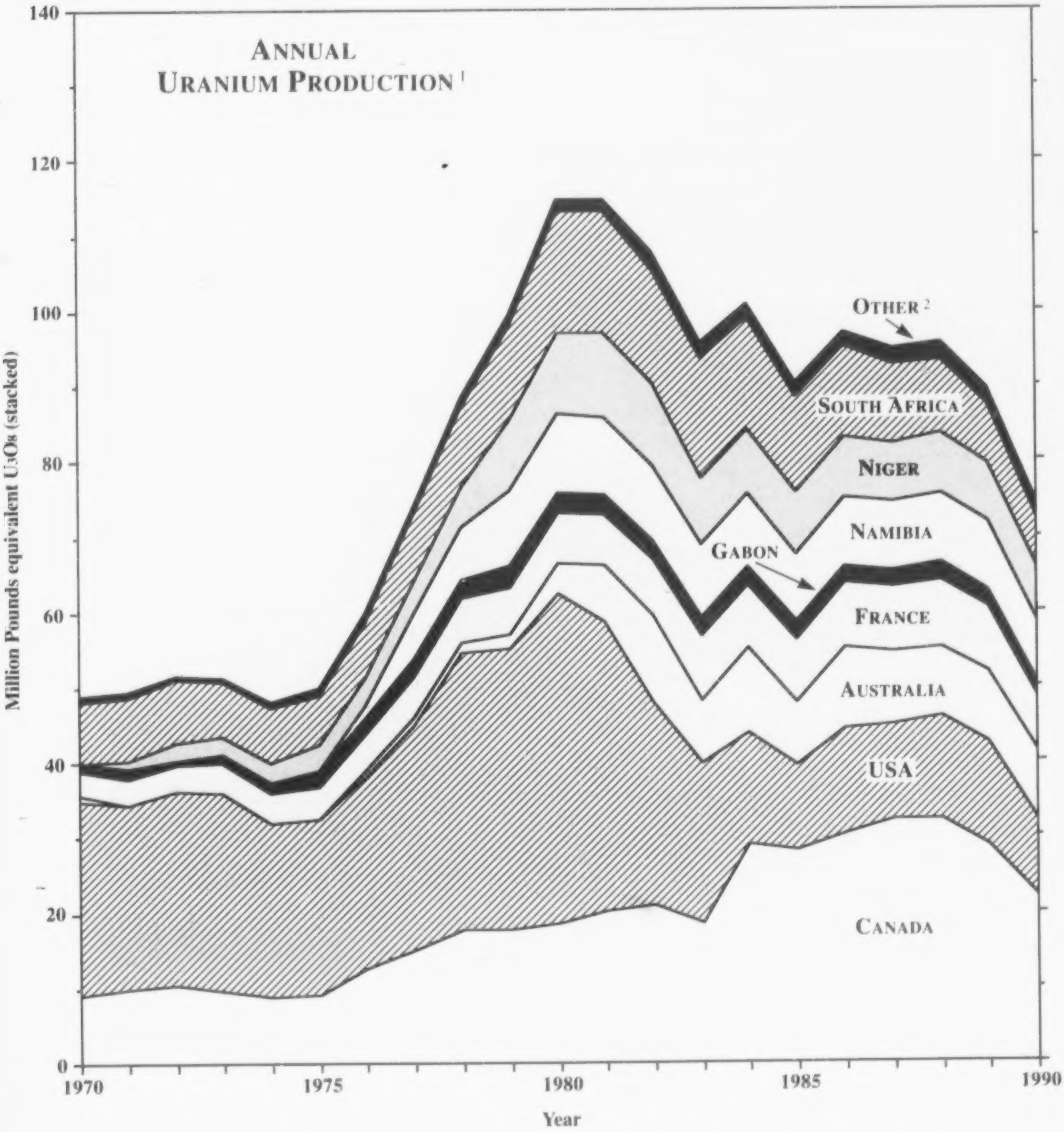

ANNUAL URANIUM PRODUCTION[1]

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[1] Estimated western world uranium production in 1990 totalled 74.5 million pounds equivalent U_3O_8 —
(Australia: 9.1 – Canada: 22.0 – France: 7.4 – Gabon: 1.8 – Namibia: 8.0 – Niger: 7.4 – South Africa: 6.4 – USA: 10.2 – Other[2]: 2.2)

[2] **Other** includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, former West Germany, and Yugoslavia (Slovenia)

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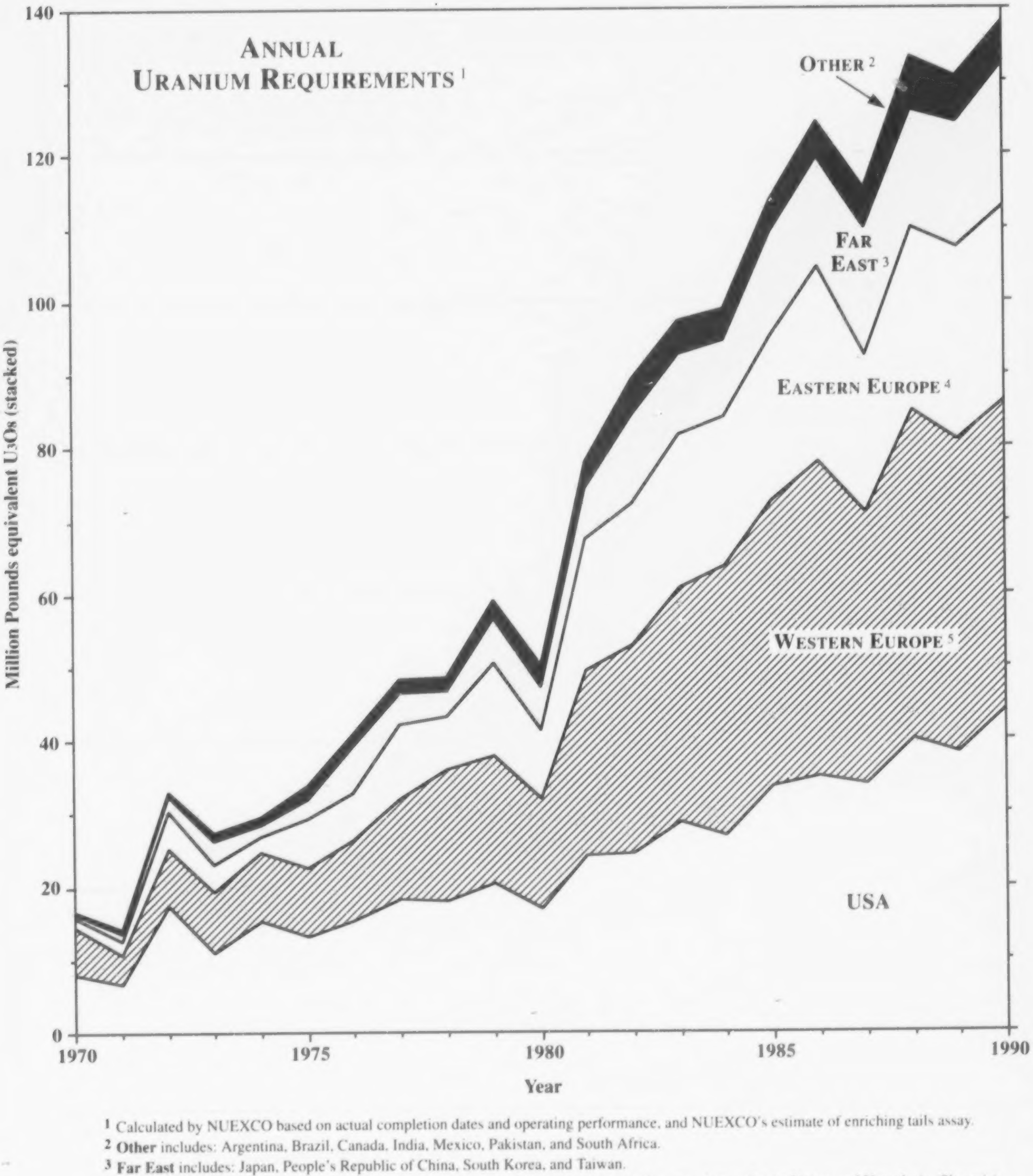
HISTORICAL MARKET DATA



[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assay.

[2] **Other** includes: Argentina, Brazil, Canada, India, Mexico, Pakistan, and South Africa.

[3] **Far East** includes: Japan, People's Republic of China, South Korea, and Taiwan.

[4] **Eastern Europe** includes: Bulgaria, Czechoslovakia, former East Germany, Finland, Hungary, former Soviet Union, and Yugoslavia (Slovenia).

[5] **Western Europe** includes: Belgium, France, former West Germany, Italy, The Netherlands, Spain, Sweden, Switzerland, and UK.

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Australia

Year	Period[1]	Consumer Price Index[2] (1989/1990 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia[5] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[4] (June 1985 = 100)
1980	Avg.	47.4	83.1	—	69.6
1981	Avg.	51.9	85.9	—	76.1
1982	Avg.	57.7	89.0	—	86.4
1983	Avg.	56.9	96.9	—	89.9
1984	Avg.	66.0	98.0	—	96.0
1985	Avg.	70.5	107.3	—	100.0
1986	Avg.	76.9	101.5	—	104.9
1987	Avg.	83.4	108.9	465.88	112.9
1988	Avg.	89.4	111.8	496.90	115.4
1989	Avg.	96.2	117.0	534.65	126.0
1990	Avg.	103.2	123.4	571.43	129.7
1991	Avg.	106.5	120.1	600.35	133.7
Jan	1991	—	125.6	—	133.0
Feb	1991	—	121.5	597.70	133.0
Mar	1991	105.8	119.1	—	133.3
Apr	1991	—	117.6	—	133.3
May	1991	—	117.8	592.00	133.4
June	1991	106.0	120.4	—	133.4
July	1991	—	120.4	—	133.5
Aug	1991	—	119.9	599.50	133.8
Sept	1991	106.6	118.3	—	134.2
Oct	1991	—	118.7	—	134.4**R**
Nov	1991	—	120.6	612.20	134.5**R**
Dec	1991	107.6	121.2	—	134.5
Jan	1992	—	120.9	—	134.7
Feb	1992	—	120.9	625.20	134.8**R**
Mar	1992	107.6	120.0	—	134.9**R**
Apr	1992	—	120.5	—	134.9**R**
May	1992	—	122.4	624.80	135.1**R**
June	1992	107.3	124.6	—	135.1**R**
July	1992	—	126.2	—	135.1

P = Preliminary **R** = Revised since last month

[1] Monthly data for the period 1967 to 1990 appears in NUEXCO Monthly Report 278.

[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1989 to June 1990 = 100.0). Figures shown at end of quarter represent quarterly average. Base year changed from 1980/81 in Monthly Report 286.

[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (CATALOGUE No. 6411.0).

[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (CATALOGUE No. 6312.0). Figures for the latest fourteen months shown are subject to revision.

[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (CATALOGUE No. 6302.0).

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Canada

Year	Period	Industrial Products Price Index: All Commodities[1] (1986 = 100)[2]	Consumer Price Index: All Items (1986 = 100)[3]	Wage-earner Data: Average Hourly Earnings (C$)[4] Uranium Mines (SIC 057)	Metal Mines (SIC 061)	Mines, Quarries and Oil Wells (SIC 061-092)	Metal Rolling, Casting and Extruding (SIC 299)	Chemicals and Chemical Products Industries (SIC 371-379)
1980	Avg.	75.9	67.2	—.—	—.—	—.—	—.—	—.—
1981	Avg.	83.6	75.5	—.—	—.—	—.—	—.—	—.—
1982	Avg.	89.0	83.7	—.—	—.—	—.—	—.—	—.—
1983	Avg.	92.1	88.5	17.22	15.27	14.58	10.17	11.03
1984	Avg.	96.3	92.4	17.89	16.25	15.29	10.59	11.67
1985	Avg.	99.0	96.0	18.53	16.73	15.83	11.54	12.14
1986	Avg.	100.0	100.0	19.38	16.88	15.98	12.20	12.65
1987	Avg.	102.8	104.4	20.12	17.16	16.25	13.04	13.22
1988	Avg.	107.2	108.6	20.91	18.60	17.22	13.58	13.72
1989	Avg.	109.4	114.0	21.97	19.60	18.37	14.02	14.31
1990	Avg.	109.7	119.4	22.90	20.53	19.11	14.88	15.13
1991	Avg.	108.6	126.2	24.35	22.44	20.59	14.94	16.22
Jan	1991	111.1	125.0	23.79	21.53	19.94	14.86	15.51
Feb	1991	110.6	125.0	25.23	22.32	20.39	14.82	15.84
Mar	1991	109.8	125.5	24.19	22.17	20.57	15.50	16.19
Apr	1991	109.1	125.5	24.77	22.20	20.57	14.76	16.28
May	1991	108.6	126.1	24.38	21.86	20.51	15.04	16.26
June	1991	108.5	126.7	23.58	21.96	20.10	14.67	16.25
July	1991	108.2	126.8	24.70	22.52	20.17	14.52	16.07
Aug	1991	107.8	126.9	23.78	22.32	20.96	14.72	16.01
Sept	1991	107.6	126.7	24.23	22.43	20.61	14.95	16.40
Oct	1991	107.3	126.5	24.40	22.42	20.80	15.13	16.43
Nov	1991	107.3	127.0	24.58	22.68	21.05	15.00	16.46
Dec	1991	107.2	126.4	24.53	22.80	21.39	15.30	16.92
Jan	1992	107.2	127.0	24.79	22.78	21.48	15.78	16.91
Feb	1992	108.1	127.1	24.42	22.60	21.41	16.18	16.82
Mar	1992	108.2	127.5	24.92	22.92	21.37	16.31	16.62
Apr	1992	108.1	127.6	**[5]	23.39	22.04	16.60	16.69
May	1992	108.6	127.8	**	23.22	21.47	16.64	16.78
June	1992	108.9 **R**	128.1	**	23.02 **R**	20.71 **R**	16.42 **R**	16.51 **R**
July	1992	109.1 **R**	128.4	**	23.26 **P**	20.65 **P**	16.03 **P**	16.45 **P**
Aug	1992	109.2	128.4	**	—.—	—.—	—.—	—.—

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (CATALOGUE 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1990 is found in NUEXCO Monthly Report 278.

[2] New Base Year of 1986 as of NUEXCO Monthly Report 266. Previous Base Year was 1981.

[3] New Base Year of 1986 as of NUEXCO Monthly Report 264. Previous Base Year was 1981.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1990 is found in NUEXCO Monthly Report 278. SIC number revisions shown starting in Monthly Report 287.

[5] As of April 1992, Statistics Canada no longer provides specific information on uranium mine wages. The data has been included with Metal Mines (SIC 061).

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South Africa

Year	Period	Average Declared Working Costs per Metric Ton of Gold Ore Milled[1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled[2] (March 1982 = 100)	Consumer Price Index[3] (1990 = 100)	Production Price Index All Groups[4] (1990 = 100)	Total Employment in Mining and Quarrying[5]	Total Salaries and Wages in Mining and Quarrying[5] (1,000 Rand)
							Annual Total[6]
1980	Avg.	35.50	—	25.5	27.7	709,042	2,237,689
1981	Avg.	41.87	—	29.4	31.5	722,918	2,756,928
1982	Avg.	47.23	103.9	33.7	35.9	702,041	3,181,584
1983	Avg.	51.88	115.0	37.8	39.7	700,901	3,563,282
1984	Avg.	58.95	130.3	42.2	43.0	711,511	4,134,390
1985	Avg.	68.70	151.7	49.1	50.3	724,587	4,778,612
1986	Avg.	80.18	177.9	58.2	60.1	756,637	5,767,950
1987	Avg.	95.01	223.1	67.6	68.5	751,864	6,911,395
1988	Avg.	106.69	241.1	76.2	77.5	705,355	7,774,054
1989	Avg.	116.65	273.0	87.4	89.3	700,360	8,833,934
1990	Avg.	129.37	305.3	100.0	100.0	677,742	10,193,209
1991	Avg.	136.06	322.4	115.1	111.4	630,722	10,934,073
							Monthly Total
Jan	1991	—	—	107.7	108.6	648,944	935,839
Feb	1991	—	—	109.0	109.0	650,948	893,373
Mar	1991	137.66	323.82	110.0	108.2	651,843	924,930
Apr	1991	—	—	111.5	108.8	639,939	887,722
May	1991	—	—	113.2	109.8	630,481	887,107
June	1991	134.65	317.23	114.0	110.3	640,908	890,595
July	1991	—	—	115.5	111.2	637,581	881,182
Aug	1991	—	—	117.1	112.0	633,699	963,710
Sept	1991	137.11	329.05	118.7	113.2	639,535	1,014,424
Oct	1991	—	—	119.8	114.8	584,435	860,529
Nov	1991	—	—	120.9	115.3	602,461	853,864
Dec	1991	134.81	319.33	123.8	115.8	602,486	940,798
Jan	1992	—	—	125.1	115.9	622,143	953,440
Feb	1992	—	—	126.2	116.3	620,846 **R**	930,659 **R**
Mar	1992	139.69	331.46	127.3	116.9	620,773	954,628
Apr	1992	—	—	128.9	118.4	608,027	941,295
May	1992	—	—	129.9	119.4	—	—
June	1992	140.69	334.63	131.2	120.5	—	—
July	1992	—	—	132.4	121.5	—	—
Aug	1992	—	—	133.8	—	—	—

P = Preliminary   **R** = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in NUEXCO Monthly Report 278.

[2] Page 16 of Report 178 contains description and calculation of index.

[3] Central Statistical Service, Pretoria: All income groups-weighted average. Historical Data by month appears in NUEXCO Monthly Report 278.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa. Base Year changed from 1985 to 1990 in NUEXCO Monthly Report 284.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in NUEXCO Monthly Report 236.

[6] Annual total is shown, rather than monthly average, for indicated year.

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United States

		Producer Price Index[1]					Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
Year	Period	Industrial Commodities (1982 = 100)	All Commodities (1982 = 100)	Consumer Price Index[2] (1982-84 = 100)	GNP Implicit Price Deflator[3] (1987 = 100)	GDP Implicit Price Deflator[3] (1987 = 100)	Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
1980	Avg.	88.0	89.8	82.4	71.7	71.7	10.26	10.63	8.31	6.94
1981	Avg.	97.4	98.0	90.9	78.9	78.9	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	83.8	83.8	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	87.2	87.2	12.58	13.43	10.58	8.66
1984	Avg.	103.3	103.7	103.9	91.1	91.0	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	94.4	94.4	13.38	13.74	11.57	9.46
1986	Avg.	100.0	100.2	109.6	96.9	96.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	100.0	100.0	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	103.9	103.9	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	108.5	108.5	13.59	13.72	13.09	10.05
1990	Avg.	115.8	116.3	130.7	113.2	113.2	14.10	14.36	13.54	10.32
1991	Avg.	116.5	116.5	136.2	117.8	117.8	14.89	14.64	14.07	10.73
Jan	1991	119.3	119.0	134.6	—	—	14.73	14.63	13.85	10.60
Feb	1991	117.2	117.2	134.8	—	—	14.80	14.55	13.81	10.59
Mar	1991	115.6	116.1	135.0	116.4	116.5	14.93	14.55	13.85	10.55
Apr	1991	115.6	116.0	135.2	—	—	14.85	14.56	13.96	10.63
May	1991	116.1	116.5	135.6	—	—	14.79	14.52	14.01	10.66
June	1991	116.1	116.4	136.0	117.4	117.5	14.88	14.51	14.05	10.74
July	1991	116.0	116.1	136.2	—	—	15.09	14.56	14.16	10.77
Aug	1991	116.3	116.2	136.6	—	—	14.82	14.64	14.06	10.78
Sept	1991	116.3	116.1	137.2	118.2	118.2	15.04	14.59	14.21	10.84
Oct	1991	116.7	116.4	137.4	—	—	14.94	14.75	14.25	10.78
Nov	1991	116.7	116.4	137.8	—	—	15.29	14.89	14.27	10.88
Dec	1991	116.1	115.9	137.9	118.9	118.9	15.13	14.87	14.34	10.96
Jan	1992	115.7	115.6	138.1	—	—	15.06	14.74	14.30	10.90
Feb	1992	116.0	116.0	138.6	—	—	15.22	14.67	14.29	10.90
Mar	1992	115.9	116.1	139.3	119.8	119.8	15.05	14.57	14.26	10.92
Apr	1992	116.4**R**	116.3	139.5	—	—	15.02	14.61	14.39	10.98
May	1992	117.2	117.1	139.7	—	—	15.09	14.76	14.39	10.99
June	1992	118.0	117.8	140.2	120.6	120.6	15.15**R**	14.70**R**	14.38	11.06
July	1992	118.1	117.8	140.5	—	—	15.38**P**	15.03**P**	14.49**R**	11.05
Aug	1992	118.1	117.6	140.9	—	—	—.—	—.—	14.37**P**	11.06**P**

P = Preliminary **R** = Revised since last month

[1] US Bureau of Labor Statistics, Washington, DC: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents Historical data is presented in NUEXCO Monthly Report 278.

[2] US Bureau of Labor Statistics, Washington, DC: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in NUEXCO Monthly Report 278.

[3] US Department of Commerce, Washington, DC: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The Gross National Product (GNP) and Gross Domestic Product (GDP) Implicit Price Deflators (IDP) are published quarterly, and seasonally adjusted. Historical data for the GNP IPD is presented in Report 278. GDP IPD information first published in NUEXCO Monthly Report 288. GNP IPD Base Year change from 1982 to 1987 in NUEXCO Monthly Report 284.

[4] US Bureau of Labor Statistics, Washington, DC: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in NUEXCO Monthly Report 278.

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Uranium Deliveries To The European Community[1]

— Compiled from data published by the Euratom Supply Agency —

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price		Spot Contracts Average Price	
			in ECU per pound U_3O_8	in US Dollars per pound U_3O_8	in ECU per pound U_3O_8	in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19
1990	12,800	16.7	ECU 23.08	$29.39	ECU 7.60	$ 9.68
1991	12,900	13.0	ECU 21.05	$26.09	ECU 7.30	$ 9.05

P = Preliminary **R** = Revised since last month

[1] The twelve European Community member nations are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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US Uranium Marketing Data

— Compiled from data published by the US Energy Information Administration [1] —

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers [2] (million pounds U_3O_8)	Average Price of Delivered Uranium [2] (\$/lb. U_3O_8)	Quantity of Uranium Imported (million pounds U_3O_8)	Average Price of Imported Uranium (\$/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	\$16.10	3.6	n/a	1.2
1977	29.9	27.8	\$19.75	5.6	n/a	4.0
1978	37.0	31.6	\$21.60	5.2	n/a	6.8
1979	37.5	33.0	\$23.85	3.0	n/a	6.2
1980	43.7	35.0	\$28.15	3.6	\$43.10	5.8
1981	38.5	32.6	\$34.65	6.6	\$32.90	4.4
1982	26.9	23.5	\$38.37	17.1	\$25.19	6.2
1983	21.2	24.2	\$38.21	8.2	\$26.16	3.3
1984	14.9	22.5	\$32.65	12.5	\$21.86	2.2
1985	11.3	21.7	\$31.43	11.7	\$20.08	5.3
1986	13.5	18.9	\$30.01	13.5	\$20.07	1.6
1987	13.0	20.8	\$27.37	15.1	\$19.14	1.0
1988	13.1	17.6	\$26.15	15.8	\$19.03	3.3
1989	13.8	18.4	\$19.56	13.1	\$16.75	2.1
1990	8.9	20.5	\$15.70	23.7	\$12.55	2.0
1991	8.0	26.8	\$13.66	16.3	\$15.55	3.5

P = Preliminary **R** = Revised since last month

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity.*
1984-1991: Energy Information Administration, *Uranium Industry Annual.*

[2] Data for 1976-1981 includes both domestic utilities and agents.

[3] Includes imports by domestic utilities and domestic suppliers.

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VIAG
State of Bavaria
various counties in Bavaria
38.8%
58.3%
2.9%
BAG
Munich
Isar–Amperwerke AG
50%
Isar 1
50%
25%
Gundremmingen B&C*
* Owned by KGV
75%
Energieversorgung Ostbayern
93.5%
100%
Grafenrheinfeld
Biblis A&B
100%
Landes-hauptstadt München
10%
25%
Mülheim-Kärlich (not operating)
100%
25%
Isar 2
40%
SBK
68.85%
100%
16%
Kalkar SNR 300 (shutdown)
NERSA
100%
Superphénix LMFBR—France
RWE
100%
37%
100%
RWE–Energie
Essen
Hoescht AG
Nukem GmbH
37.5%
25%
0.5%
100%
100%
Uranit GmbH
Decatox GmbH
Nukem USA
100%
Cycle Resource Investment Corp.
50%
Sheep Mountain Partners USA
50%
US Energy USA
BNFL UK
UCN Netherlands
33.3%
33.3%
33.3%
Urenco
50%
MAN-Uranit
100%
Rheinbraun AG
Cologne
50%
Uranerzbergbau GmbH
50%
Deilmann AG
100%
100%
Uranerz Expl. & Mining
Uranerz USA
33.3%
33.3%
25%
Rabbit Lake Canada
Key Lake Canada
Crow Butte USA
◇ 35%
35% ◇
VEAG
Berlin
30% ◇
Framatome France
Siemens AG
50%
50%
NPI Joint Venture
KWU division
BWH
50%
50%
NVD
100%
Siemens Capital Corp. USA
100%
SPC USA
100%
ANF
VEBA
100%
55.4%
37.1%
Preussen-Elektra
Hannover
GfE
Ruhrkohle AG
30.2%
25.8%
71%
Steag AG
Other German Utilities
24%
52.3%
GNS
23.7%
Sydkraft AB Sweden
10.5%
VKR
100%
80%
Techsnab-export Russia
51%
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49%
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100%
Cogema Uran Services GmbH
69.4%
10.3%
10.3%
UG
5%
5%
5%
Rössing Namibia
10%
Yeelirrie Australia
79%
Kiggavik Canada
25%
Highland USA
25%
Gas Hills USA
6.54%
Somaïr Niger
53.9%
4%
6.25%
ERA Australia
1.25%
Brokdorf
20%
66.7%
Stade
33.3%
Unterweser
100%
50%
Krümmel
50%
Würgassen
100%
33.3%
Brunsbüttel
66.7%
Grohnde
50%
50%
City of Hamburg
100%
Hamburger Gesellschaft für Beteiligungsverwaltung
71.4%
HEW
Hamburg
VEW
Dortmund
75%
Elektro-mark
25%
Emsland
GKH
Stadtwerke Aachen
12%
31%
5%
GKW
26%
HKG
26%
100%
THTR-300 (shutdown)
State of Baden-Württem-berg
Badischer EVB
KWR Rhein-Felden
OEW
private share-holders
14.9%
49.5%
5.8%
15.3%
14.5%
BADEN-WERK
Karlsruhe
7.5%
KKL Switzerland
50%
KKP 1&2 Philippsburg
50%
28%
KWO Obrigheim
35%
37%
Other German Utilities
*
17.5%
Fessenheim 1&2 France
*
5%
Cattenom 1&2 France
EVS
Stuttgart
NWE
TWS
German Railway
ZEAG
40.9%
29.1%
18.2%
9.1%
2.7%
GKN
Neckarwestheim
100%
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GERMAN NUCLEAR INDUSTRY

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